

NIH Pain Consortium

Centers of Excellence in Pain Education



Mr. Gateway: Acute and Chronic Head and Neck Pain

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Introduction

This is a case of a fifty-two-year-old male smoker with a history of substance abuse with recurrent laryngeal cancer who presents with increased throat and neck pain, dysphagia (pain with swallowing), and dehydration.

You are part of the inter-professional team that will manage Mr. Gateway during his hospitalization. You are asked to come evaluate the patient, who will be admitted to the surgical service and help advise on how to manage his pain.

Case Goals and Objectives

- Assessing a patient in pain
- Assessing opioid risk factors
- Establishing patient and provider goals of pain management
- Administering opioid analgesics of different formulations and applying equianalgesic dosing
- Determining barriers to effective pain management

Audience Demographics

This case is targeted towards:

- Medical students in years 3 and 4.
- Dental students in years 3 and 4.
- Pharmacy students: pharmacotherapy seminar and clinical clerkship.
- Nursing students in year 2 and masters level nursing programs.

Event 1: Emergency Department Visit

Patient Information

Patient Name: Mr. Gateway

Age: 52

Gender: male

Introduction to Mr. Gateway

A hospital exam room shows a hospital bed on the left-hand side of the screen. A rolling cart in the background pushed into the corner of the room holds various medical apparatus, including a blood pressure cuff, pole for hooking IV fluid bags on top, and a sharps biohazard disposal bin. Boxes with various sizes of exam gloves are mounted on the wall to the right of the screen.

Mr. Gateway sits on the hospital exam bed. He wears a dark blue pullover fleece on top of a black turtleneck and jeans. His short dark brown hair meets a closely trimmed salt and pepper beard and he wears glasses.

Dr. Barreveld walks into the room and shakes Mr. Gateway's hand. She wears a white coat that reaches the top of her knees, over top of jeans. Her hair falls just below her shoulders and she carries a purple file folder in her hands.

"Hello Mr. Gateway," she begins, "My name is Dr. Barreveld. I'm one of the hospitalists here."

"Hi, Dr. Barreveld," Mr. Gateway responds.

"I talked with your nurse from the emergency department," Dr. Barreveld continues, *"and she gave me a little history of your story, but I want to hear from you what brings you to use today, and also ask you some questions about your medical history."*

“So, what’s been going on?” she asks.

“Well, I’ve been having this problem with my mouth and throat,” Mr. Gateway says. “I’ve got some pain and it’s been getting harder for me to eat and to swallow.”

“And when did this start?” asks Dr. Barreveld.

“Well, I had a problem with this a few years back, but most recently it’s been about month or two. Even the last few weeks it’s been just getting harder and harder for me to open my mouth fully, and to eat and swallow. Even swallowing the pills were very difficult.”

“So, you’ve got pain in your throat,” Dr. Barreveld asks, motioning to her own throat, “and also in your mouth?”

Mr. Gateway nods. “Yes, the mouth pain,” as he gestures to his mouth, “sometimes my mouth and my tongue really hurt when I’m eating anything. Especially if it’s hot or rough.” He points to his jaw. “I really can’t open my mouth fully, but otherwise it’s really my neck and throat where most of the pain is,” as he then motions to his throat.

“And when did you say this all started?”

“Well, I had cancer back four years ago when I was forty-eight,” Mr. Gateway says. “I was diagnosed with some throat cancer. I had treatment for that and it seemed to get better with the treatment. I had a clean bill of health at the one and two-year checks, but I haven’t been back since then.”

“Okay,” Dr. Barreveld says. “And are you having any pain elsewhere?”

“No, it’s mostly just in the mouth when I’m eating or swallowing. Then the throat is always hurting.” Mr. Gateway gestures to his throat again. “Then sometimes I get some sharp, shooting pains down into my neck and shoulder. But it’s really it’s mostly just the throbbing in the throat that bothers me the most.”

Dr. Barreveld takes note of this on a paper she laid on top of the file folder she holds. *“Okay. On a scale of zero to ten, if ten is the worst pain you can imagine what number would you give the pain in your throat right now?”*

“I’d say it’s probably a seven,” Mr. Gateway replies. *“It’s very strong.”*

“Does it get higher than that?” Dr. Barreveld asks.

“Oh yeah, it goes off the charts when I try to eat something.”

“Okay, and what medications do you take for pain?”

“About a month ago, my main doctor gave me a hundred eighty Percocet and told me to take one or two of them when I had the pain,” Mr. Gateway responds. *“I ran out of those about a week ago. It was getting harder and harder for me to swallow them anyway.”*

“Okay, and then any other medications that you’re taking for the pain?”

“No, not for the pain. I just haven’t had anything. But the pain’s really getting worse and worse.”

“And besides swallowing, does anything else make the pain worse?” Dr. Barreveld asks. *“And what makes it better?”*

“Just swallowing, even just to clear my throat or talk too much, that makes worse. About the only thing I’ve found besides the medicine that makes it better is if I take some cold water, hold it in my mouth and sort of swallow it slowly. That eases the discomfort,” says Mr. Gateway.

“Okay, have you been losing weight with all of this?”

“I think I lost about ten pounds,” says Mr. Gateway. *“I’m just not eating.”*

Dr. Barreveld makes note of this answer. *“Well, I’m sure you must be a little scared with all this going on. I know that you’ve had the cancer diagnosis before.”*

“Yeah, that’s a big worry and now I noticed when I’m brushing my teeth that my gums bleed. I’m not sure if I have a cracked filling or something. I

need to see a dentist and I need to see a doctor, because I'm really worried about these things."

"Well, we'll definitely touch base with all of your doctors. I do want to ask you a couple more things about your cancer and then about your medical history in general," says Dr. Barreveld.

She continues, "So, your cancer was diagnosed four years ago you said. And what treatment did you have for your cancer?"

Mr. Gateway gestures to his neck. "Well, they cut out what they could of the tumors. They gave me radiation and chemotherapy. They told me that they got it all. They were hopeful I'd do well with that."

"Okay," says Dr. Barreveld. "Do you have any other medical problems at all?"

"Well, I still smoke. I've been smoking for twenty-five years, about a pack a day. Sometimes I get short of breath and I was told I get emphysema and I take an inhaler for that when it gets bad."

"Okay. Are you still drinking, too?" Dr. Barreveld asks. "I read somewhere that you were drinking a little more heavily."

Mr. Gateway shrugs this off. "Well, you know, I used to drink a lot, a bottle of vodka a day, but six months ago I decided I'm going clean. I'm with AA and I haven't touched a bottle or any alcohol really since then."

"Great," says Dr. Barreveld. "Any other surgeries besides the throat surgery you've had?"

"I work construction, and I busted up my leg once and needed surgery with some pins in that. Other than that, nothing really," Mr. Gateway says.

"Okay, and any other medications besides the Percocet you were prescribed?"

"Just the inhaler that I need, but nothing else that I've been prescribed," says Mr. Gateway.

“Okay, and what allergies to medications do you have?” Dr. Barreveld asks.

“Well, codeine makes me sick to my stomach and I got a rash with some ampicillin, but those have been the only problems that I’ve had.”

“Excellent. And now some about your family history. Any cancer in the family? Any medical problems in your family I should know about?”

Mr. Gateway strokes his beard in thought. “No, no cancer. My father was an alcoholic and he died young. I don’t know what he died of. My mother also died young. She had a heart attack is what they said, but she was a very nervous woman and I’m not sure about that.”

“I have a brother and a sister,” Mr. Gateway continues. During the entire interview he looks at the floor to avoid looking at Dr. Barreveld. “I haven’t seen them in ages, but last I knew they were fine.”

“Are you living with anyone?” Dr. Barreveld asks.

“No, I got divorced several years ago. My wife lives with my seventeen-year-old son.”

“Okay,” says Dr. Barreveld. “How about working? Are you able to work?”

“I’ve been working construction. Then when this cancer hit, and all the treatments that I needed, I haven’t been able to work. So, I’ve been on disability since then.”

“Okay. These have been some hard years,” says Dr. Barreveld. “Has anyone been helping you to cope with any of this, or have you seen anyone to help with this?”

“You know, there was one time when I talked to someone because after my divorce, I got really depressed and I even thought about killing myself at one point. So, they made me go see this doctor. But I got better after that,” Mr. Gateway says.

“Are you depressed right now?” asks Dr. Barreveld.

“Well, lately I haven’t been sleeping and I haven’t been eating. I don’t know if it’s more being depressed or more just really being very scared about this cancer and could it be that, or what else is going on?” Mr. Gateway replies.

“Yeah, I’m sure,” Dr. Barreveld says in commiseration. *“You haven’t had any thoughts of hurting yourself or anything?”*

“No,” says Mr. Gateway, shaking his head.

“Okay, good,” Dr. Barreveld says. *“Any other substances? You say you’re smoking, you stopped drinking. Anything else you’re taking that’s not prescribed to you?”*

“Well, back in my wild days I used to snort cocaine,” Mr. Gateway says, *“but I haven’t done that in ages. I do find that sometimes smoking pot really helps sort of ease my nerves and helps me get some sleep. So, I do that occasionally.”*

“Well, thank you for being open and honest with me about all of your medical history,” Dr. Barreveld tells Mr. Gateway. *“Is there anything else you think I should know? Any other pains you’re having, any side effects from medications, any other symptoms that you think are concerning?”*

“The only other thing is that I have a little constipation, but I don’t know if that’s because I’m not eating or drinking. Other than that, just the things we talked about,” replies Mr. Gateway.

“Okay, well thank you Mr. Gateway,” says Dr. Barreveld. *“Why don’t we go ahead and exam you?”*

“Okay,” Mr. Gateway acquiesces.

Physical Exam

Vital Signs

Temperature 97.2, Blood Pressure 152/88, Heart Rate 96, oxygen saturation 96% on room air

General appearance

Thin man, mild distress

Head, ears, eyes, nose, throat and mouth exam

Normocephalic, sclera anicteric, conjunctivae pale, oral mucosa dry, oropharynx clear, tongue midline and mobile. Missing molars in the left lower quadrant, mandibular incisor mobility. Decreased mouth opening and jaw range of motion. Numerous broken and unrepaired teeth and some gingival bleeding. There is a 6mm reddish white plaque on the left posterior lateral surface of his tongue

Neck

Normal range of motion but neck pain radiating to right shoulder with neck extension, post-radiation skin changes, palpable thyroid with irregularly shaped anterior mass, bilateral submandibular lymphadenopathy

Lungs

Soft expiratory wheezes otherwise clear

Heart

Tachycardic, regular rhythm, no murmurs

Abdomen

Soft, palpable liver tip, no masses, no tenderness to palpation

Extremities

No cyanosis, clubbing or edema

Skin

No rashes

Musculoskeletal

Strength 5/5 upper and lower extremities

Neurological

Alert and oriented, normal gait, cranial nerves intact

Lab Results

Hematology

- White blood cell
 - 6.2
- Hematocrit
 - 31.4
- Platelets
 - 172

Chemistry

- Sodium
 - 145
- Potassium
 - 3.2
- Chloride
 - 109
- Bicarbonate
 - 29
- Blood Urea Nitrogen (BUN)
 - 33 (*elevated level: patient may be dehydrated*)
- Creatinine
 - 1.5

Liver Enzymes

- Total bilirubin
 - 0.8
- Aspartate aminotransferase (AST)
 - 82 (*AST:ALT ratio of 2:1 may be a sign of chronic alcohol abuse, but other lab value examining liver synthesis are within normal limits: e.g. INR – not shown – and platelet count*)
- Alanine aminotransferase
 - 39
- Alkaline Phosphatase
 - 135

Urine Toxicology

- Oxycodone
 - Negative (*patient has not taken oxycodone in likely over a week as the oxycodone is not detected by a urine screen 3-4 days after the last dose*)
- Tetrahydrocannabinol (THC)
 - positive (*patient has used marijuana in the recent past*)
- All other substances
 - Negative

Imaging Studies

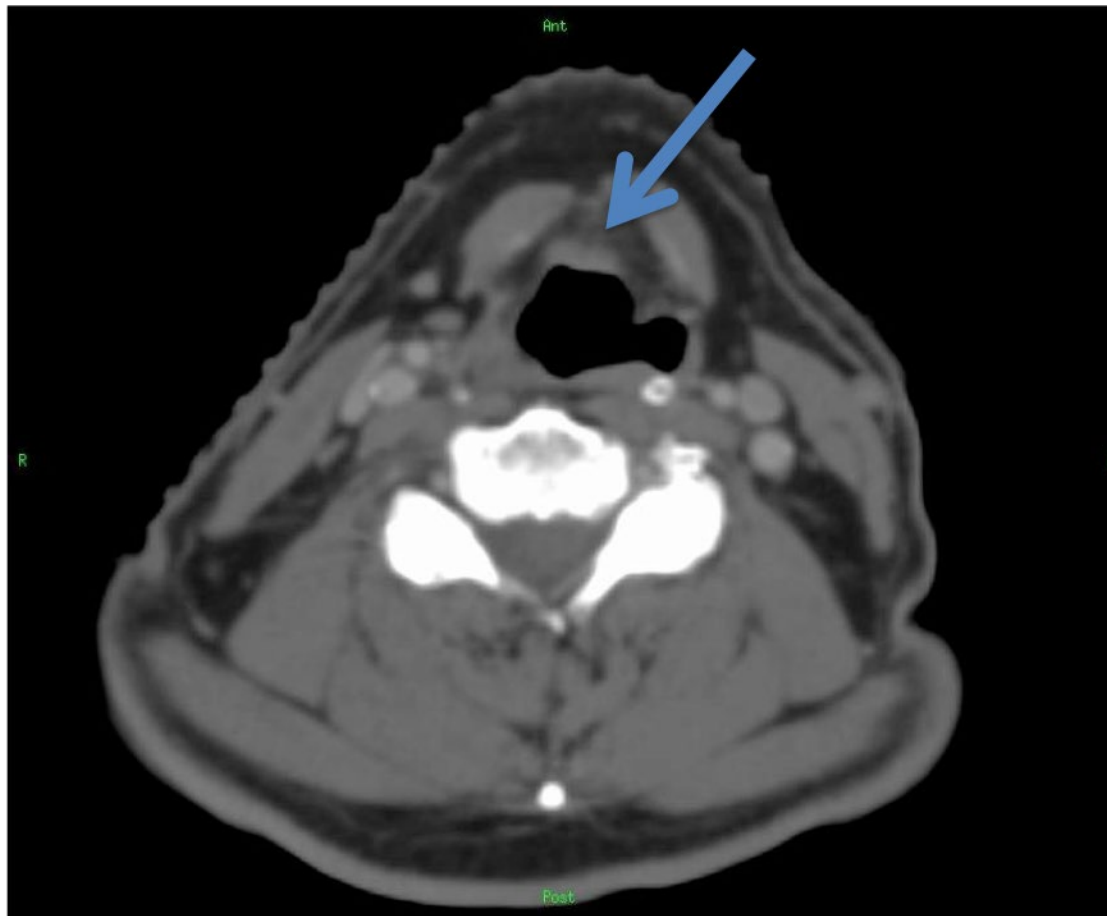


Figure 1

The arrow on Figure 1 that shows an axial image from a computerized tomography (CT) scan of the neck shows cancer invading the thyroid.

Next Steps

In addition to radiation oncology and oncology input to guide with staging and treatment, a dental consult is initiated to evaluate Mr. Gateway's limited mouth range of motion and mouth pain.

The National Cancer Institute offers [excellent guidelines on oral and dental management prior to cancer therapy](#).

Event 2: Dental Consult

Questions You Might Consider for Mr. Gateway's Dental Consult

- How do you manage acute dental pain episodes in a patient already on opioids to control chronic pain?
- How do you distinguish tooth pain from reversible (requiring a normal filling) and irreversible (requiring endodontic (root canal treatment)) pulpitis?
- How do you distinguish between a temporomandibular joint and/or a masticatory muscle-based problem?
- Describe the protocol for managing a patient suffering from xerostomia. ([Learn more about side effects of treatment for mouth and throat cancer and oral complications](#))
- Describe the priorities for dental treatment planning for a patient who is about to undergo radiation for head and neck cancer?

More information about various dental pain and exams to determine potential causes and diagnoses can be found by visiting the "Dental Pain" appendix.

You can find a summary of important articles, documents, and references for a dental consult by visiting the resources/references appendix.

Dental Pre-Chemotherapy and Radiation Protocol

1. Oncology asks for dental evaluation
2. Full radiographic and clinical dental exam to be reviewed by dentist to identify dental disease pre-treatment
3. Dental intervention of acute disease
4. Surgery for tumor removal
5. Dental re-evaluation pre-chemo-radiation
6. Chemo-radiation therapy
7. Dental maintenance

Mr. Gateway's Squamous Cell Carcinoma of the Tongue



Figure 2

A clinical photo of Mr. Gateway's tongue shows intraoral mixed red-white lesion. Such a lesion has an 80% chance of having pre-cancerous dysplasia. An unexplained white lesion (leukoplakia) has a 20% chance of containing dysplastic cells.

Surgery is scheduled to remove the affected region.

Mr. Gateway's Dental Imaging Pre-Treatment

Bitewing Radiographs

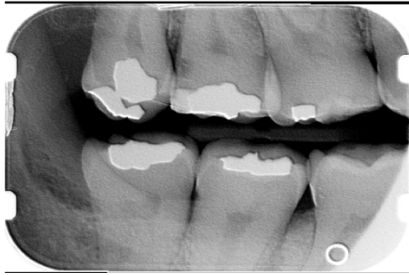


Figure 3: bitewing radiograph



Figure 4: bitewing radiograph

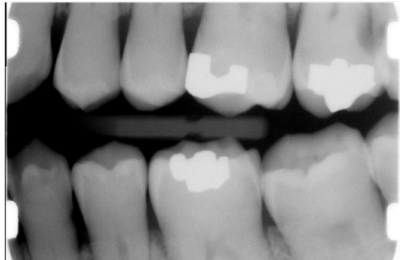


Figure 5: bitewing radiograph



Figure 6: bitewing radiograph

Periapical Radiographs



Figure 7: periapical radiograph



Figure 8: periapical radiograph

Pre-Surgery Dental Treatment

Mr. Gateway had hopeless and guarded teeth #1, #15, and #29 extracted before his tumor removal.

A periodontal debridement (gross teeth cleaning) was completed to control gingival inflammation.

Carious lesions #2 and #16 were restored.

Post-Surgery/Pre-Radiation Evaluation

Panograph of Mr. Gateway's Dentition



Figure 9: panograph of Mr. Gateway's dentition

Bitewing Radiographs



Figure 10: bitewing radiograph



Figure 11: bitewing radiograph

Tooth #32 was extracted and multiple carious lesions were identified (by tooth # and surface) and restored: 3LB, 4BLD, 5BD, 6B, 7B, 8I, 10B, 12BD, 13D, 14L, 18M, 19D, 21D, 28B, 30B

Teeth # 16, 17 were scheduled for extraction.

Mr. Gateway's TMD Examination Results

History

Patient has had limited range of motion (ROM) since his initial surgical procedure. Pain is a dull ache left > right at a 3-4 of 10 aggravated with jaw function such as eating or talking. His left maxillary teeth are sensitive, especially with jaw function.

Examination

(normal values: vertical ROM 40 mm, lateral symmetrical of at least 5-6 mm)

- Pain free jaw ROM was 22 mm, 34 mm with pain in the left masseter. Passive ROM via assistance 38 mm. He points to left superficial masseter at the insertion of the masseter on the zygoma as the pain's location with increased ROM.
- Palpation: The patient is sensitive to palpation bilaterally under his mandible. Able to duplicate his chief complaint with palpation of the left superficial masseter which brings on his left posterior tooth pain.
- No joint sounds are evident
- Intraoral exam reveals numerous unrestored teeth. But he does contact bilaterally on his posterior teeth when closing his teeth together indicating that his occlusion is stable. No teeth are sensitive to palpation.

Mr. Gateway's TMD Diagnosis Summary

1. Why rule out arthralgia?

Patient has good lateral ROM and is negative to TMJ palpation.

2. Why rule out contraction and spasm?

Due to patient's moderate pain level and ability to stretch muscle to increase ROM.

3. Why is the myofascial pain diagnosis supported?

Patient has moderate pain level aggravated with function, duplicated ULQ tooth pain with trigger point palpation, i.e. referred pain causing familiar pain.

4. Treatment

Jaw stretch exercises to improve pain free ROM, self-care, PT referral based on response to home therapy.

Radiation Therapy and Risk of Osteoradionecrosis

Mr. Gateway is a 52-year-old male with a history of laryngeal cancer and tongue invasive squamous cell carcinoma invading tonsillar tissues who will be treated with 3 cycles of TPF chemotherapy. He will receive cisplatin therapy during radiation.

Radiation will be given over 60 treatment fractions:

- Tongue and regional lymphatics PTV1 dose 5400 cGy (180 per fraction) for 60 fractions. Rapid Arc technique with 6MV machine.
- PTV2 900 cGy (180 per) for 5 treatments
- PTV3 900 cGy (180 per) for 5 treatments
- Total dose 7200 cGy

So, the questions for you to consider are:

- What is the chance of developing osteoradionecrosis with future extractions?
- Do we consider just the dose to V2 of 900 cGy or the total dose of 7200 cGy?
- Does the increased vascularity of the maxilla as compared to the mandible reduce the chances of necrosis?
- How does hyperbaric oxygen (HBO) influence post-operative healing?

Event 3: Pain Medication Regimen

You now are at Mr. Gateway's bedside and are meeting with him to assess his pain and come up with a treatment plan.

How are you going to assess Mr. Gateway's pain? (Choose the one best answer.)

1. [Ask him to describe it.](#)
2. [Ask him what number his pain is from 0 to 10 on a numeric rating scale.](#)
3. [Consult his vital signs and determine how much medication he has received in the ED.](#)
4. [Consult his vital signs and determine how much medication he has received in the ED.](#)
5. [Ask him how much and what pain medication he uses at home and assess for any risk factors he has for opioid misuse.](#)
6. [All of the above](#)

Mr. Gateway demonstrates some characteristics of pseudoaddiction (e.g. running out of medication early because his pain was not adequately treated) and tolerance (despite not having taken any opioid for a week prior to his presentation to the hospital, tolerance can persist even if a patient has not taken opioids for an extended period).

Knowing what type and how much pain medication he was taking prior to his presentation will also be important when establishing a medication regimen to treat his acute pain.

Mr. Gateway's Specific Opioid Misuse Factors

Mr. Gateway's specific opioid misuse factors¹ put him at high risk for aberrant medication behaviors and include:

1. Poor social support (one of the most important reasons a patient might be at risk for misuse)
2. Substance abuse history by the patient and by a family member
3. History of severe depression
4. Multiple psychosocial stressors
5. History of alcohol rehabilitation
6. Heavy cigarette smoking

Possible Goals of Pain Management

Possible goals of pain management and concerns from Mr. Gateway's perspective could include the following:

- Good pain control
- Medications that work quickly
- Medications that do not have to be swallowed
- How to improve quality of life
- Ways to improve functioning
- Avoiding side effects
- Avoiding stigma

¹ Jamison RN, Edwards RR. Risk Factor Assessment for Problematic Use of Opioid for Chronic Pain. Clin Neuropsychol. 2012 Aug 30 <https://www.ncbi.nlm.nih.gov/pubmed?term=22935011>

The 4 “A’s”

Mr. Gateway's goals of pain management reflect his provider's goals as well.

You can think of these pain management goals in terms of the 4 "A's."

1. **Analgesia** - Decrease pain and suffering, safely manage a patient with opioid tolerance, and appropriately dose medications and use adjuvants as indicated.
2. **Activity** - Improve activity, quality of life, and function.
3. **Adverse Effects** - Effectively anticipate and manage medication side effects.
4. **Aberrant Behaviors** - Effectively manage a patient with a history of substance abuse and opioid risk factors and focus on medication effects on behavior and personality.

In addition, effective communication of treatment plans and inter-professional coordination are key goals in caring for Mr. Gateway.

Beginning Pain Medication Regimen

What opioid pain medication regimen do you recommend starting for Mr. Gateway's acute pain? (Choose the one best answer.)

1. [Oxycodone elixir 10-15 mg PO Q4h PRN](#)
2. [IV Morphine by Patient Controlled Analgesia \(PCA\) 1.5mg every 7 minutes](#)
3. [IV Hydromorphone \(Dilaudid\) PCA 0.2mg every 7 minutes](#)
4. [Hydromorphone 0.5-1mg IV Q2h PRN](#)
5. [Transdermal fentanyl patch 25mcg/h](#)

Monitoring Mr. Gateway While on Opioid Therapy

Treating acute pain with opioids and medication titration requires vigilant monitoring to ensure safe prescribing practices.

Mr. Gateway presents with **risk factors for sedation and respiratory depression**² while on opioid therapy:

1. Smoking history and emphysema
2. History of opioid use and increasing opioid requirements
3. Surgical factors that may affect his breathing

Other patient risk factors can include:

1. Sleep apnea
2. Obesity
3. Older age
4. Major organ failure or cardiac or pulmonary disease

² Jarzyna D, Jungquist CR, Pasero C, Willens JS, Nisbet A, Oakes, L, et al. American Society for Pain Management Nursing guidelines on monitoring for opioid-induced sedation and respiratory depression. Pain Manag Nurs. 2011 Sep;12(3):118-45 e10 <https://www.ncbi.nlm.nih.gov/pubmed?term=21893302>

All patients should be monitored while on opioid therapy and especially during acute treatment. Some important considerations include:

1. Screening for risk factors and comprehensive medical history
2. Frequent monitoring of respiratory rate
 - a. A low respiratory rate (e.g. less than eight breaths a minute) could be secondary to opioid therapy
 - b. Technological monitors can be applied as supplements to vital sign monitoring such as capnography (wave-form measurement of expired carbon dioxide (ETCO₂) or pulse oximetry (monitoring oxygen saturation))
 - c. Monitoring for sedation (there are different scales that can be used for this)
 - d. Monitoring for side effects (including constipation, mental status effects, nausea, etc.)

Event 4: Post Op Regimen

Mr. Gateway's Post Op Hospital Course

Mr. Gateway's pain is managed with a PCA and he is medically stabilized. He then undergoes repeat palliative surgical resection. His post-operative course has been complicated by difficult to manage pain and the patient's resistance to transition to oral therapy.

He is now post-operative day 3 and has been using a hydromorphone PCA and reports satisfactory pain control. His renal function has normalized. He is now able to eat soft solids. You spend time talking with him about his concerns and discuss a possible oral regimen with him.

His PCA settings are:

- 0.4mg IV hydromorphone available every 7 minutes, no limit, no continuous infusion

How will you help determine an oral opioid regimen for Mr. Gateway?

Equianalgesic Dosing

Converting from intravenous to oral opioid regimens can be guided by equianalgesic tables³. Data within equianalgesic tables has been derived from single-dose cross-over studies conducted in the 1950s and 1960s in opioid-naïve patients with acute post-operative pain and chronic cancer pain. Dose conversions have not been adequately studied beyond these initial studies and there are limitations to the tables.

For instance, factors that can influence pharmacokinetics and pharmacodynamics are not accounted for in these tables. Patient-specific

³ Knotkova H, Fine PG, Portenoy RK. Opioid rotation: the science and the limitations of the equianalgesic dose table. J Pain Symptom Manage. 2009 Sept;38(3):426-39.
<https://www.ncbi.nlm.nih.gov/pubmed?term=19735903>

factors that should be considered include organ function, pain level, interacting medications, and comorbidities.

Nevertheless, equianalgesic tables can serve as a guide when calculating opioid conversions and comparing opioid potencies.

An “opioid conversion calculator,” such as the one accessed on the following website, can be used to help calculate opioid conversions:
<http://www.globalrph.com/narcoticonv.htm>

Visit the "Opioid Risk and Dosing" appendix to learn more about relative strengths of different opioids, conversions from oral morphine equivalent to transdermal fentanyl, and conversions from oral morphine equivalent to oral methadone.

Incomplete Cross-Tolerance

After assessing Mr. Gateway's current pain level and how to transition him to an oral therapy, you will also need to account for incomplete cross-tolerance.

Definition

- **Tolerance** is a state of adaptation to a drug that results in reduced effects at a given dosage.
- **Cross-Tolerance** is tolerance to a second drug (i.e. opioid) developed as a result of exposure to a first drug (i.e. opioid).
- **Incomplete cross-tolerance** accounts for differences in opioid characteristics including receptor activity; therefore when patients are rotated to a different opioid, they are more likely to be sensitive to both the analgesic and adverse effects of the new opioid.

Incomplete Cross-Tolerance Scenarios

Consider one of the following scenarios to account for incomplete cross-tolerance in Mr. Gateway:

1. Pain that is well controlled and there is a need for a different opioid formulation AND/OR the patient is experiencing intractable adverse effects.
 - a. Decrease the dose by 25-57% (the extent of the reduction is commonly 25%, 33%, or 75%)
2. Pain is not well-controlled
 - a. Use the calculated equianalgesic dose (click the "Opioid Risk and Dosing" button to learn more) or in the presence of severe pain, consider increasing the calculated dose by a small percentage.
 - i. This is not common practice and should be only implemented under close monitoring.

Equianalgesic Question 1

You access Mr. Gateway's PCA record and see he's used 15.6 mg IV hydromorphone as recorded by his PCA in the last 24 hours.

How much total daily oral oxycodone does this equal?

[Access the opioid conversion calculator here.](#)

1. [101 mg oral oxycodone per 24 hours](#)
2. [189 mg oral oxycodone per 24 hours](#)
3. [208 mg oral oxycodone per 24 hours](#)
4. [256 mg oral oxycodone per 24 hours](#)

Equianalgesic Question 2

Reduce the total dose of 208 mg oral oxycodone per 24 hours for Mr. Gateway to account for incomplete cross-tolerance.

1. [25% reduction = around 156 mg](#)
2. [33% reduction = around 140 mg](#)
3. [50% reduction = around 104 mg](#)

Choose Formulation and Divide Dose

An immediate-release oxycodone formulation dosed PRN may be more beneficial at this time – Mr. Gateway's pain requirements are likely to change as his postoperative/acute pain improves. Short-acting opioids are not typically dosed around the clock and can be adjusted as indicated.

Long-acting opioids which are administered “around the clock” could be considered in the future depending on his current pain control needs. This could also be initiated as an outpatient.

Divide the total daily dose of oxycodone by 6 since it will be administered every 4 hours.

- around 25 mg every 4 hours (about a 25% reduction)
- around 20 mg every 4 hours (about a 33% reduction)
- around 15 mg every 4 hours (about a 50% reduction)

Providing a range can allow for more flexibility in dosing. E.G.: Oxycodone 15-20 mg PO q4h PRN pain.

Event 5: Discharge Regimen

Day of Discharge

Mr. Gateway has been stable on the oral opioid medication you recommended. You also helped start him on some non-opioid pain medications.

You contacted Mr. Gateway's primary care physician, who will see him and help manage his pain control and opioid prescription. He has an appointment in one week. He will also follow-up with oncology to possibly pursue chemotherapy and radiation therapy. You help prepare his discharge instructions.

His PCA settings are:

- 0.4mg IV hydromorphone available every 7 minutes, no limit, no continuous infusion

How will you help determine an oral opioid regimen for Mr. Gateway?

Additional Medications⁴

Once Mr. Gateway was medically stabilized post-operatively and transitioned to oral medications, he was also started on:

- gabapentin titrated to 300 mg PO TID
- acetaminophen 650 mg PO q6h
- ibuprofen 600 mg PO q6h

Adjuvant medications can be thought of by medication "class." Some examples are:

- Acetaminophen (Tylenol)
- Non-steroidal anti-inflammatory drugs (NSAIDs, e.g. ibuprofen, celecoxib (Celebrex), etc.)
- Anti-convulsants (e.g. gabapentin (Neurontin), pregabalin (Cymbalta), etc.)
- Anti-depressants (e.g. amitriptyline, duloxetine (Cymbalta), etc.)
- Topical agents (e.g. lidocaine ointment, lidoderm patch, etc.)
- Steroids (e.g. dexamethasone, etc.)

⁴ Swarm R, Abernethy AP, Anghelescu DL, Benedetti C, Blinderman CD, Boston B, et al. Adult cancer pain. J Natl Compr Canc Netw. 2010 Sep;8(9):1046-86
<http://www.ncbi.nlm.nih.gov/pubmed?term=20876544>

National Center for Complementary and Alternative Medicine (NCCAM) Website:
<http://nccam.nih.gov/health/pain/chronic.htm>

Bardia A, Barton DL, Prokop LJ. Efficacy of complementary and alternative medicine therapies in relieving cancer pain: a systematic review. Journal of Clinical Oncology. 2006;24(34):5457-5464.
<http://www.ncbi.nlm.nih.gov/pubmed/17135649>

Non-pharmacologic pain treatment modalities: biofeedback, cognitive behavioral therapy, acupuncture, massage, music, reiki, relaxation methods, heat or cold, therapeutic touch, chiropractic therapy, pet therapy, etc.

General Outpatient Concerns

Mr. Gateway will need a team-work approach to coordinating his outpatient care. Important concerns to address include:

1. Frequent visits with his primary care physician to coordinate care with his multiple providers
2. Possible consultation with a palliative care specialist
3. Opioid monitoring: initiation of an opioid contract, formal risk assessment and periodic urine drug screens
4. Monitoring of and treating medication side effects
5. Psychological/psychosocial support
6. Addiction counseling
7. Possible social work help to identify financial services that may be available to him

Potential Barriers and Obstacles to Effective Pain Control⁵

Mr. Gateway presents with multiple challenges to receiving good pain control:

- Health care provider bias/stigma
- History of substance abuse
- Opioid tolerance
- Poor social support and little contact with family
- Financial stressor
- History of non-compliance with medical appointments
- Fear of dying

Discharge

Mr. Gateway is discharged home on oxycodone 10-15 mg PO q4h PRN and his adjunct medication regimen. He thanks you for helping him with his pain management and for listening to his concerns.

⁵ Jamison RN, Edwards RR. Risk Factor Assessment for Problematic Use of Opioids for Chronic Pain. Clin Neuropsychol. 2012 Aug 30 <http://www.ncbi.nlm.nih.gov/pubmed?term=22935011>

Post-Test Questions

These questions derive recommendations of "best prescribing practices" from American guidelines published in 2009-2012. Questions have been chosen and modified from "Test of Opioid Knowledge" developed by McCracken et al. 2012¹³. Choose the single best answer for each question based on the answers provided.

Post-Test Question 1

Which best describes the way a starting dose is determined for opioid therapy in an opioid naive older patient?

1. [Start with a relatively low dose and adjust based on response.](#)
2. [Start with a dose that is likely to be effective for most adults.](#)
3. [Choose a starting dose based on the severity of the patient's pain.](#)
4. [Start with a high dose and reduce it if intolerable side effects occur.](#)

Post Test Question 2

During assessment for the potential risks of chronic opioid therapy, providers should screen for:

1. [Depression](#)
2. [Substance misuse](#)
3. [All other medications being used](#)
4. [Urine toxicology](#)
5. [All of the above](#)

Post Test Question 3

Which of the following are appropriate uses of opioids?

1. [As a sleeping aid](#)
2. [To reduce toxicity](#)
3. [Both of the above](#)
4. [None of the above](#)

Post Test Question 4

For patients with neuropathic pain, opioid therapy should only be considered:

1. [After a failed trial of antidepressant or anticonvulsant adjuvant analgesics.](#)
2. [After a failed trial of non-opioids like acetaminophen or NSAIDs failed to help.](#)
3. [After both of the above.](#)
4. [After neither of the above.](#)

Post Test Question 5

What does the following expected effect of long-term opioid exposure define?

"A state of adaptation in which exposure to a drug induces changes that result in a diminution of one of the drugs' effect over time."

1. [Withdrawal](#)
2. [Tolerance](#)
3. [Addiction](#)
4. [Dependence](#)

Post Test Question 6

Which one of the following can be an anticipated effect of opioid toxicity?

1. [Mydriasis \(dilated pupils\)](#)
2. [Anxiety](#)
3. [Rhinorrhea \(runny nose\)](#)
4. [Myoclonic jerks \(sudden muscle twitches\)](#)

Post Test Question 7

Which of the following is a common sign of opioid withdrawal?

1. [Flu-like symptoms](#)
2. [Miosis \(pinpoint pupils\)](#)
3. [Confusion](#)
4. [Slow respiration](#)

Post Test Question 8

Which one of the following risk factors is more predictive of opioid misuse?

1. [Patient gender](#)
2. [Personal history of a substance abuse disorder](#)
3. [Poor social support](#)
4. [Age](#)

Post Test Question 9

If addiction risk factors are detected, the:

1. [Patient should not receive any opioid therapy](#)
2. [Patient should receive opioid therapy as normal](#)
3. [Patient should be given only weak opioids](#)
4. [Patient should be closely monitored and supported while using opioids](#)

Post Test Question 10

Aberrant behaviors that cease when pain is relieved, such as drug hoarding, "doctor shopping," early postscripton refill requests or unauthorized dose escalations, is referred to as:

1. [Pseudoaddiction](#)
2. [Addiction](#)
3. [Physical dependence](#)
4. [Tolerance](#)

Answer Key

Event 3

How are you going to assess Mr. Gateway's pain? (Choose the one best answer.)

1. Ask him to describe it. *(Incorrect)*
2. Ask him what number his pain is from 0 to 10 on a numeric rating scale. *(Incorrect)*
3. Consult his vital signs and determine how much medication he has received in the ED. *(Incorrect)*
4. Consult his vital signs and determine how much medication he has received in the ED. *(Incorrect)*
5. Ask him how much and what pain medication he uses at home and assess for any risk factors he has for opioid misuse. *(Incorrect)*
6. All of the above *(Correct)*

Beginning Pain Medication Regimen

What opioid pain medication regimen do you recommend starting for Mr. Gateway's acute pain? (Choose the one best answer.)

1. Oxycodone elixir 10-15 mg PO Q4h PRN *(Incorrect)*
2. IV Morphine by Patient Controlled Analgesia (PCA) 1.5mg every 7 minutes *(Incorrect)*
3. IV Hydromorphone (Dilaudid) PCA 0.2mg every 7 minutes *(Correct)*
4. Hydromorphone 0.5-1mg IV Q2h PRN *(Incorrect)*
5. Transdermal fentanyl patch 25mcg/h *(Incorrect)*

Equianalgesic Question 1

You access Mr. Gateway's PCA record and see he's used 15.6 mg IV hydromorphone as recorded by his PCA in the last 24 hours.

How much total daily oral oxycodone does this equal?

[Access the opioid conversion calculator here.](#)

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2. 33% reduction = around 140 mg (*Correct*)
3. 50% reduction = around 104 mg (*Incorrect*)

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Which best describes the way a starting dose is determined for opioid therapy in an opioid naive older patient?

1. Start with a relatively low dose and adjust based on response.
(Correct)
2. Start with a dose that is likely to be effective for most adults.
(Incorrect)
3. Choose a starting dose based on the severity of the patient's pain.
(Incorrect)
4. Start with a high dose and reduce it if intolerable side effects occur.
(Incorrect)

Post Test Question 2

During assessment for the potential risks of chronic opioid therapy, providers should screen for:

1. Depression (Incorrect)
2. Substance misuse (Incorrect)
3. All other medications being used (Incorrect)
4. Urine toxicology (Incorrect)
5. All of the above (Correct)

Post Test Question 3

Which of the following are appropriate uses of opioids?

1. As a sleeping aid (*Incorrect*)
2. To reduce toxicity (*Incorrect*)
3. Both of the above (*Incorrect*)
4. None of the above (*Correct*)

Post Test Question 4

For patients with neuropathic pain, opioid therapy should only be considered:

1. After a failed trial of antidepressant or anticonvulsant adjuvant analgesics. (*Incorrect*)
2. After a failed trial of non-opioids like acetaminophen or NSAIDs failed to help. (*Incorrect*)
3. After both of the above. (*Correct*)
4. After neither of the above. (*Incorrect*)

Post Test Question 5

What does the following expected effect of long-term opioid exposure define?

"A state of adaptation in which exposure to a drug induces changes that result in a diminution of one of the drugs' effect over time."

1. Withdrawal (*Incorrect*)
2. Tolerance (*Correct*)
3. Addiction (*Incorrect*)
4. Dependence (*Incorrect*)

Post Test Question 6

Which one of the following can be an anticipated effect of opioid toxicity?

1. Mydriasis (dilated pupils) (*Incorrect*)
2. Anxiety (*Incorrect*)
3. Rhinorrhea (runny nose) (*Incorrect*)
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Post Test Question 7

Which of the following is a common sign of opioid withdrawal?

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3. Confusion (*Incorrect*)
4. Slow respiration (*Incorrect*)

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1. Patient gender (*Incorrect*)
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4. Age (*Incorrect*)

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If addiction risk factors are detected, the:

1. Patient should not receive any opioid therapy (*Incorrect*)
2. Patient should receive opioid therapy as normal (*Incorrect*)
3. Patient should be given only weak opioids (*Incorrect*)
4. Patient should be closely monitored and supported while using opioids (*Correct*)

Post Test Question 10

Aberrant behaviors that cease when pain is relieved, such as drug hoarding, "doctor shopping," early postscripton refill requests or unauthorized dose escalations, is referred to as:

1. Pseudoaddiction (*Correct*)
2. Addiction (*Incorrect*)
3. Physical dependence (*Incorrect*)
4. Tolerance (*Incorrect*)

Appendix 1: Pain Assessment Tools

There are several different scales that can be used to assess for pain severity.

11-Point Numerical Rating Scale (NRS)

The most common is the 11-point Numerical Rating Scale (NRS), which uses the range 0-10. The benefits of the NRS are its simplicity and validity. Possible drawbacks include response variability and moderate correlation with functional status.

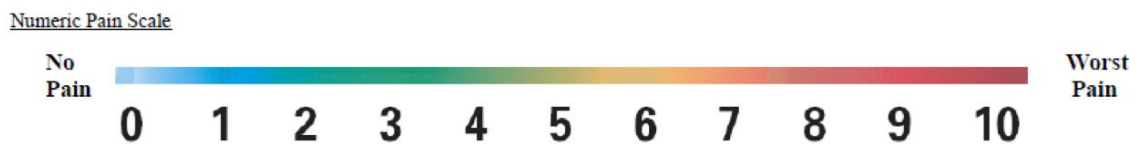


Figure 12: 11-Point Numerical Rating Scale

Functional Pain Scale⁶

Instructions:

Ask the patient if pain is present. If the patient has pain, ask him or her to rate the pain subjectively as either "tolerable" or "intolerable."

Finally, find out if the pain interferes with function. If the patient rates the pain as "tolerable," establish whether the pain interferes with any activity. If the pain is "intolerable," determine whether the pain is so intense as to prevent passive activities. See the chart below for guidelines.

- 0: No pain
- 1: Tolerable (and does not prevent any activities)
- 2: Tolerable (but does prevent some activities)
- 3: Intolerable (but can use telephone, watch TV, or read)
- 4: Intolerable (but cannot use telephone, watch TV, or read)
- 5: Intolerable (and unable to verbally communicate because of pain)

Scoring:

The patient's subjective rating of pain and the objective determination of the pain's interference with activities will produce a corresponding score on a scale of 0-5.

A lower score equates to less severe pain and less interference with functional abilities, if any. Ideally, all patients should reach a 0 to 2 level, preferably 0 to 1.

⁶ Gloth FM III, Scheve AA, Stober CV, Chow S, Prosser J. The Functional Pain Scale: reliability, validity, and responsiveness in an elderly population. *J AM Med Dir Assoc.* 2001;2(3):110-114.

It should be made clear to the respondent that limitations in function only apply if limitations are due to the pain being evaluated.

Opioid Risk Tool

OPQRST⁷

When assessing pain, it is important to ask certain questions in order to get a full understanding of the patient's pain history. There are different methods you can use to remember the important questions to ask. One option is the mnemonic "OPQRST."

O – Onset: When did the pain start? What was happening at that time?

P – Palliative and Provocative factors: What makes the pain better? Worse? (Include specific activities, positions or treatments.)

Q – Quality: Describe the pain. Is it burning, sharp, shooting, aching, throbbing, etc.?

R – Region and Radiation: Where is the pain? Does it spread to other areas?

S – Severity: How bad is the pain? (There are several scales to use, which will be discussed in the following slide)

T – Timing: When does the pain occur? Has it changed since onset? If so, how?

⁷ Powell RA, Downing J, Ddungu H, Mwangi-Powell FN. Pain Management and Assessment. In: Andrea Kopf NGP, editor. Guide to Pain Management in Low-Resource Settings. Seattle: IASP: International Associations for the Study of Pain; 2010. P. 67-79 [http://www.iasp-pain.org/AM/Template.cfm?Section=Home&TEMPLATE=/CM/HTMLDisplay.cfm\\$CONTENTID=11669](http://www.iasp-pain.org/AM/Template.cfm?Section=Home&TEMPLATE=/CM/HTMLDisplay.cfm$CONTENTID=11669)

Screening

Ask, "Are you experiencing any discomfort right now?"

If No: document "zero" pain and reassess periodically

If Yes: ask about its nature (verbal description) pattern (over time) and location

Try to quantify the intensity of the pain, show the patient the rating tools we use and determine which one is easiest and most meaningful for them.

Try to quantify the intensity of the pain, show the patient the rating tools we use and determine which one is easiest and most meaningful for them.

Starting with the **Numeric Risk Tool** (remember, this is an eleven-point scale of 0-10, not 1-10), ask the patient if they would recognize:

- if the discomfort were completely gone ("a rating of 0")
- or the worst they or anybody else could possibly experience ("10")

Have the patient rate the intensity of their pain/discomfort "right now" verbally with a number of by pointing to the number that represents their pain intensity.

Once the patient understands this scale, follow-up questions may be tried without the visual aid:

- "On a scale of 0 to 10, how much pain (or discomfort) are you experiencing now?"

If the Numeric Risk Tool is not easy and meaningful, use the Verbal Descriptor Scale:

- Determine if discomfort is "none" (chart 0) or the worst possible (chart 10).
- Ask if the discomfort or pain is mild, moderate, severe, or extreme.

- Record 2 (for mild), 4 (for moderate), 6 (for severe), or 8 (for extreme) accordingly.
- If the patient reports it's between two words, select the odd number between them (e.g. the score of a report of pain between mild and moderate = 3)

If that isn't easy and meaningful, use the **Functional Pain Scale**.

Determine if it is tolerable ("less than or equal to 5") or intolerable ("greater than or equal to 5").

- Tolerable pain that does not interfere with activities = 2
- Tolerable pain that interferes with physically demanding activities = 4
- Intolerable pain that interferes with physically demanding activities = 5
- Intolerable pain that interferes with active but not passive activities = 6
- Intolerable pain that interferes with passive activities (e.g. reading) = 8
- Pain so severe the patient can't do any active or passive activities (e.g. can't even talk about pain without writhing/screaming) = 10

Reassess using the 4-A's determining safety and efficacy of therapy:

- **Analgesia:** To what extent did the treatment reduce the pain and make it more tolerable? This can be evaluated using one of the pain intensity scales above, the percent that pain intensity is reduced by (e.g., 30%, 50%, etc.) or adjectives (good, excellent effect) the patient uses.

- **Activity:** To what extent did the patient's activity and rest patterns improve as a result of the treatment? Does pain interfere less with usual and prescribed therapeutic (e.g. physical therapy) activity? Does pain interfere less with sleep? Does the treatment affect safety?
- **Adverse effects:** What side effects, toxicity, technology-related complications are experienced?
- **Aberrant behaviors:** Has the medication affected medication-focused behaviors or personality?

The **Faces Pain Scale** can also be used for any patient but is especially useful with children or non-verbal patients. This is a well-studied and validated scale.



Figure 13: Faces Pain Scale

A body diagram can allow patients to pinpoint their pain site(s) to help guide your examination.

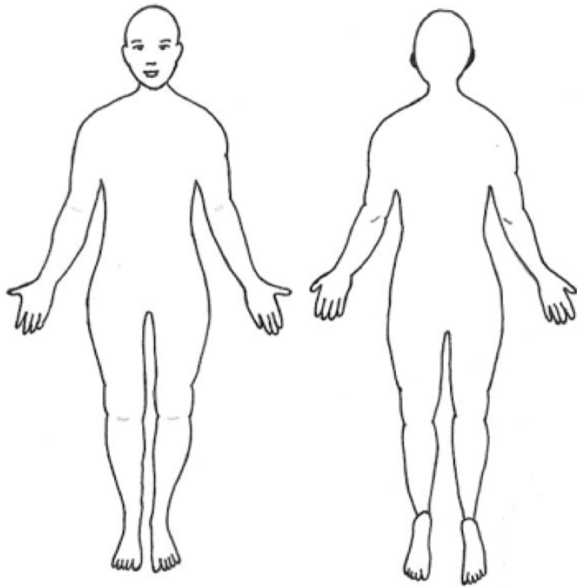


Figure 14: Body Diagram

Additionally, observing patients when they move or during the exam is a useful addition to these scales, and is essential with young children and non-verbal adults.

Physical manifestations associated with acute pain, opioid withdrawal and opioid overmedication should be distinguished.

The table below matches the signs and symptoms to their corresponding condition(s) so you can see the similarities and differences for each condition.

Signs/Symptoms	Acute Pain	Opioid Withdrawal	Opioid Overmedication
Tachycardia (fast heart rate)	Yes	Yes	No
Hypertension	Yes	Yes	No
Disphoresis (sweating)	Yes	Yes	No
Vasoconstriction (cold hands/feet)	Yes	Yes	No
Mydrasis (dilated pupils)	Yes	Yes	No
Tremors (shaking)	No	Yes	No
Dysphria/anxiety (emotional state characterized by depression, anxiety, unease)	No	Yes	No
Flu-like symptoms (runny nose, congestion, malaise, etc.)	No	Yes	No

Signs/Symptoms	Acute Pain	Opioid Withdrawal	Opioid Overmedication
Depression (low mood)	No	Yes	No
Diarrhea/vomiting	No	Yes	No
Respiratory Depression (low respiratory rate)	No	No	Yes
Bradycardia (low heart rate)	No	No	Yes
Miosis (constricted pupils)	No	No	Yes
Vasodilation (warm extremities)	No	No	Yes
Myoclonic jerks (sudden muscle contractions/twitches)	No	No	Yes

Figure 15: Signs and Symptoms of Acute Pain vs Opioid Withdrawal and Opioid Overmedication

Dental Pain

Facial Pain Referral

In acute tooth pulpalgia (pain arising from the dental pulp), the offending tooth usually is easy to discern as it will be very sensitive. Developing pulpalgia can make it very difficult to determine which tooth is responsible, and this can mimic many things including cluster headache, sinusitis, and trigeminal neuralgia. Diagnostic nerve blocks can be helpful, but sometimes observation is required until the offending tooth becomes more symptomatic and can be identified.

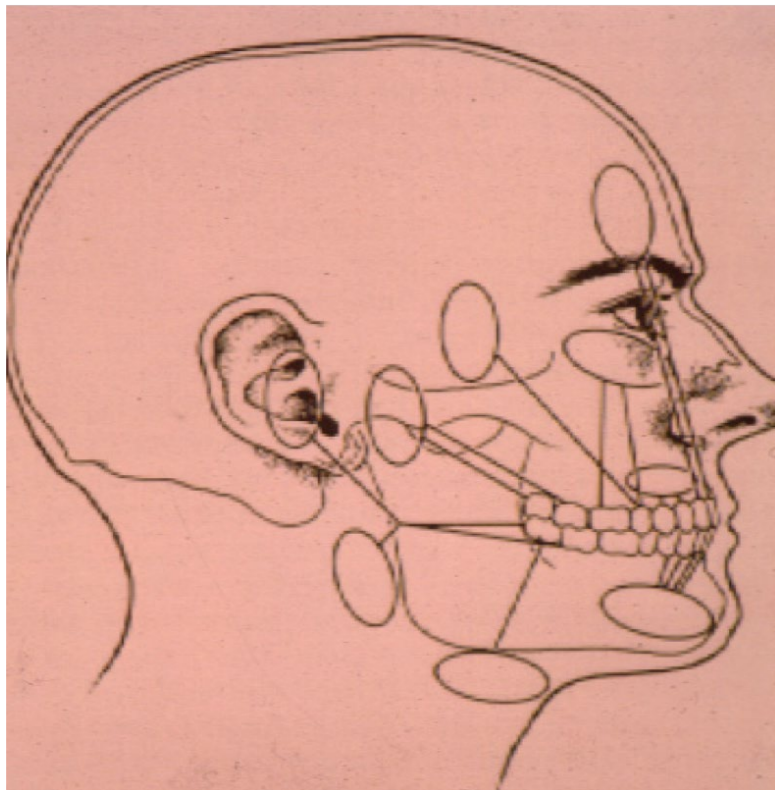


Figure 16: Common facial pain referral patterns⁸

⁸ Friction JR, Kroening RJ, Hathaway KM: TMJ and Craniofacial Pain: Diagnosis and Management. St. Louis, 1988, Ishiyaku EuroAmerica Inc. pg 57 Figure 6.5

Caries and Pain

Caries (see arrows on Figures 17 and 18) can look like they should hurt, but they do not. The patient might have sensitivity to sweets or to stimulation of the dentin (tooth material under the hard enamel) that is exposed after tooth decay or a tooth fracture. Such symptoms can be expected but are not always present from exposed dentin. Temperature changes from air and fluid contact or touching the dentin will cause transitory pain. But if the tooth hurts spontaneously (by itself), one should expect a tooth nerve (pulpal) or a gum (periodontal) problem. This could be related to caries deep enough to involve the nerve tissue in the tooth but by themselves, caries do not cause pain.



Figure 17: A bitewing radiograph with an arrow pointing to a posterior (distal) radiolucency of a mandibular second bicuspid.



Figure 18: Clinical photo of a dentition with extensive tooth wear and an arrow pointing to cervical caries on a left mandibular bicuspid.

Cracked Tooth Pain

On the radiograph shown in Figure 19, one observes well-healed apical tissues after excellent endodontic therapy (based on radiographic interpretation - the radiopacity in the apical 2/3 (noted by arrow on the image) of the tooth root is the endodontic root canal fill material). One would not expect this tooth to be sensitive to percussion.

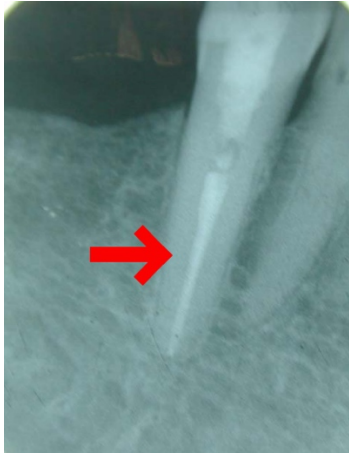


Figure 19: Well-healed apical tissues after excellent endodontic therapy

If the tooth is sensitive to percussion, a tooth fracture should be considered with a casting (noted by arrow on the image) indicated to prevent separation of the fracture. Prognosis is fair; a radiolucency developing anywhere about the periodontal ligament (PDL) confirms the fracture, and the tooth would require extraction.



Figure 20: A tooth fracture considered with a casting

Pulpagia Tooth Nerve Pain

Pain is moderate to severe and the patient will seek care immediately. The pain can awaken the patient at night and analgesics will only moderate the symptoms. Definitive treatment is required.

The following distinctions must be made:

- Acute versus chronic:
 - In acute pulpalgia there are no radiographic signs of apical pathology versus in chronic pulpitis one sees positive radiographic signs of apical pathology
- Periapical abscess:
 - Periapical abscess is extremely sensitive to palpation on the tooth (compressing inflamed periodontal ligament (PDL) at apex of tooth) and over the intraoral mucosa approximating the location of the tooth root apex (see arrow on Figure 21)
- Reversible:
 - (sensitive to cold only and without prolonged sensitivity) versus irreversible (sensitive to hot and cold, prolonged sensitivity, and can have spontaneous pain (all signs of nerve sensitization (allodynia, hyperalgesia and spontaneous pain))



Figure 21: Clinical photo of a dentition with an arrow pointing to the gingival area of the left maxillary incisor.

Periodontal Pain

Mild-to-moderate pain that can be tolerated. The patient will usually not seek care for periodontal (perio) pain unless an abscess develops.

A perio abscess is close to the gingival crest vs. pulpal abscess which approximates the apex (end of the root).

Perio abscess is moderately sensitive to percussion while periapical abscess is extremely sensitive to palpation on the tooth (compressing inflamed periodontal ligament (PDL) at apex of tooth) and over the intraoral mucosa approximating the location of the tooth root apex.



Figure 22: Clinical photo of crowded anterior teeth showing red and swollen gingival and excessive plaque from poor hygiene.

Root Canal Therapy for Chronic Periapical Periodontitis (CPP)

Note apical (end of root) radiolucency UL radiograph indicative of CPP in Figures 23-26. Tooth can be sensitive to percussion and biting, with a dull aching pain that can become spontaneous and constant. Note how the apical radiolucency heals after endodontic therapy is completed, removing all of the pulpal irritants that led to the periodontitis. Bone eventually fills in the apical area (LR radiograph).



Figure 23: A radiograph shows the mandibular left first molar before endodontic treatment, with its original root.

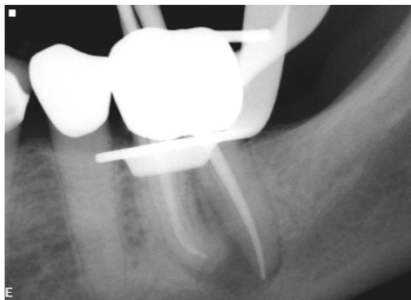


Figure 24: A radiograph shows the mandibular left first molar during an endodontic root canal treatment.



Figure 25: A radiograph shows the mandibular left first molar during the healing stage following root canal endodontic treatment.



Figure 26: A radiograph shows the mandibular left first molar further healed after root canal endodontic treatment.

Periapical Radiolucency: Is It Pathology?

The radiograph shown in Figure 27 of a lower right 2nd bicuspid has had endodontic treatment followed by placement of retrograde amalgam (see arrow on image) after apical surgery (after failed endodontic treatment, the end of the root was amputated and a silver filling placed at the end of the tooth root to seal the canal). There is a periapical radiolucency at the apex (end, see dark area) of the endodontically (endo) treated tooth. If the tooth is sensitive to percussion consider a diagnosis of chronic periapical periodontitis from failed endo surgery. If it not sensitive to percussion, consider the radiolucency to be a bone scar, and observation without treatment is indicated.



Figure 27: A radiograph shows a bicuspid with its root sealed by a silver filling after failed endodontic treatment when the end of the root was amputated.

Periocoronitis

Impacted wisdom teeth, as seen on this radiograph, are commonly asymptomatic. However, partially erupted teeth (see red arrow) can cause periocoronitis, localized inflammation of the gingiva surrounding the partially impacted tooth. Pericoronitis can be easily identified by visual exam, confirmed by palpation, and treated with warm salt water rinses and stimulation with a soft tooth brush. It is important to also rule out lymphadenopathy, which can indicate developing cellulitis requiring antibiotic therapy and definitive treatment.

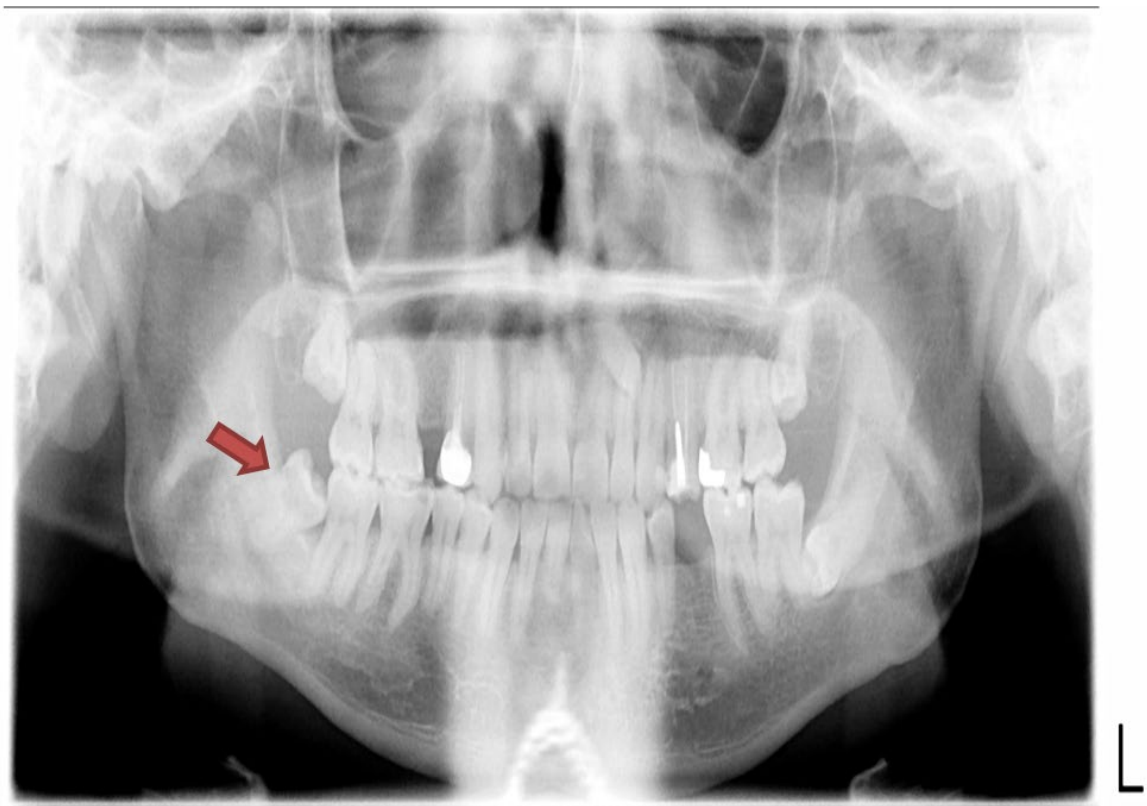


Figure 28: A panoraph shows four impacted wisdom teeth.

Pericoronitis of a partially-erupted left mandibular third molar

Treated with warm salt water rinses and stimulation with a soft tooth brush. If the problem reoccurs extraction is indicated.



Figure 29: A clinical photo shows the left mandibular posterior teeth with a tissue impacted wisdom tooth and red and swollen gingiva covering the posterior part of the tooth.

Sinusitis

The radiograph in Figure 30 highlights the proximity of the maxillary sinus (see tip of arrow) to the first molar. Although usually asymptomatic, when congestion occurs in the sinus the adjacent tooth can be sensitive to percussion (and biting) but not temperature.



Figure 30: A radiograph shows the proximity of the maxillary sinus to the first molar.

Temporomandibular Joint Pain

The temporomandibular joint (TMJ) begins to translate at about 20 mm of jaw opening. If there is a disc displacement (DD), the jaw opening will deviate to the affected side giving an S shape to the opening pattern. If the displaced disc reduces (DD with reduction) the mandible will go back to midline (see arrow). If the disc does not reduce, the mandible will remain displaced to the affected side giving the diagnosis of DD without reduction.

The “jerky” opening on the far right depicts a pattern consistent with a TMJ with arthritic changes in the joint which commonly is associated with course crepitus.

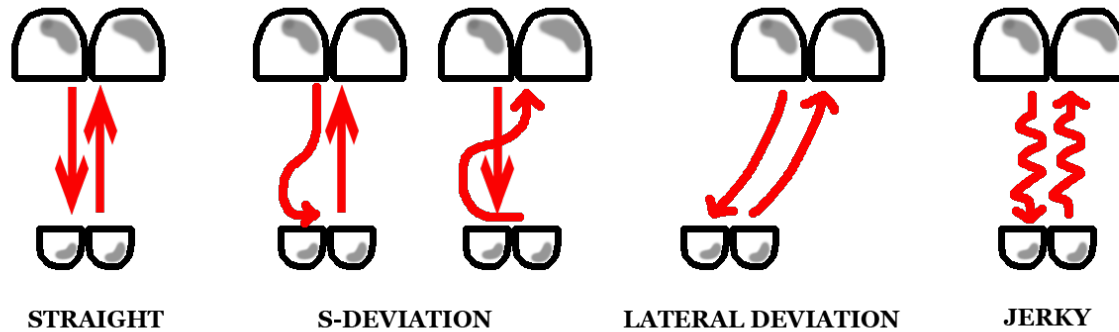


Figure 31: TMD jaw opening and closing patterns⁹

Temporomandibular Examination

Three-Part Protocol

- Range of motion
- Palpation
- Auscultation

⁹ Image reproduced from: Friction JR, Kroening RJ, Hathaway KM: TMJ and Craniofacial Pain: Diagnosis and Management. St. Louis, 1988, Ishiyaku EuroAmerica Inc. pg 46 Figure 5.5 (out of print, permission granted by author)

Differential for Decreased Range of Motion

- Contracture
- Cranial nerve
- Muscle spasm
- Myositis
- Myalgia (myofascial pain)
- Disc displacement

TMD Exam: TMJ Arthralgia Diagnosis

To confirm, the patient must have pre-auricular pain with at least two of these three maneuvers:

- Palpation
- ROM
- Joint Loading (upwards and/or distal pressure on the mandible)

TMD Exam: Masticatory Muscle Diagnosis

Muscle pain differential:

- Spasm
- Contracture
- Myofascial disease
- Myositis

TMD: Myofascial Pain Diagnosis

This is the most common diagnosis.

- Dull aching pain
- Somewhat limited ROM
- Trigger point
- Hypersensitive area
- Referred pain
- Passive stretch

Osteoradionecrosis

While there is no true "cutoff" for the risk of osteoradionecrosis (ORN), many consider 5500-6000 cGy to be such a cutoff. If a tooth area received 30 Gy, you're okay to extract with low risk of ORN, whereas an area with 65 Gy would be at high risk.

The risk of ORN is lower in the maxilla because of increased vascularity. With traditional 2-D radiation modalities in the past, the maxilla also was believed to receive lower doses of radiation than did the mandible.

Hyperbaric oxygen (HBO) is generally not considered effective, aside from anecdotal cases of success and use as a means to "legally protect" oneself from possible legislation. There isn't much high-level clinical evidence for its efficacy. Also, it can be very expensive and not covered by insurance. Finally, there is anecdotal evidence that HBO can increase vascularity to quiescent tumor cells, which would be a problem.

Recommendations for Preventing Osteoradionecrosis

1. Work with radiation oncologists/radiation physicists to "contour" and measure specific radiation doses to tooth-borne areas prior to extraction. This may be possible with radiation treatment planning software.
2. If the specific areas of the patient's dentition receive less than 5500 cGy, extract with caution after consenting the patient.
3. If the areas receive greater than 5500 cGy, inform patient of likelihood of ORN prior to exodontia.
4. HBO should only be considered at extremely high radiation doses to specific tooth areas, and only after considering the remote possibility of awakening dormant tumor cells as well as its high costs.

Opioid Risk and Dosing

When assessing Mr. Gateway's pain, you should also address any opioid risk factors he has. It's helpful to also distinguish between the following terms:

- **Tolerance** - A state of adaptation in which exposure to a drug induces changes that result in a diminution of one or more opioid effects over time.
- **Physical dependence** - A state of adaptation manifested by a drug class-specific withdrawal syndrome that can be produced by: abrupt cessation, rapid dose reduction, decreasing blood level of the drug, and/or administration of an antagonist.
- **Addiction** - A primary, chronic, neurobiologic disease with genetic, psychosocial, and environmental factors. It's characterized by behaviors that include one or more of the following: impaired control over drug use, compulsive use, continued use despite harm, and/or craving.
- **Pseudoaddiction** - This is a "concept" and not a true diagnosis and is based off of case reports and small case studies. It can be understood as an iatrogenic syndrome resulting from misinterpretation of relief-seeking behaviors as though they are drug-seeking behaviors that are commonly seen with addiction. The relief-seeking behaviors resolve upon institution of effective analgesic therapy.
- **Aberrant behavior** - Any medication behaviors departing from prescribed plan of care, ranging from mildly problematic, such as

hoarding medications to use for times of severe pain, to selling medications.

- Medication misuse - Use of a medication (with therapeutic intent) other than as directed or as indicated, whether willful or unintentional, and whether harm results or not.

Distinguishing between "addiction" and "pseudoaddiction" can be challenging and often cannot be reconciled.

Equianalgesic Example

From this table, you can compare potencies or "strengths" between the different opioids.

For instance, oral hydromorphone is more potent than oral oxycodone, which is more potent than oral morphine. Thus, lower doses of hydromorphone are needed for a similar effect of a higher dose of oxycodone.

Oral/Rectal Dose (mg)	Opioid Analgesic	Intravenous Dose (mg)
30	Morphine	10
0.4	Buprenorphine	0.3
200	Codeine	100
N/A	Fentanyl	0.1
30	Hydrocodone	N/A
7.5	Hydromorphone	1.5

Oral/Rectal Dose (mg)	Opioid Analgesic	Intravenous Dose (mg)
20	Oxycodone	N/A
100	Tramadol	N/A

Figure 32: Potencies and Strengths Between Different Opioids

Analgesic Fentanyl

Calculations for transdermal fentanyl should be made based on the manufacturer's recommendations using the table below.

Oral 24-Hour Morphine Equivalent (mg/day)	Transdermal Fentanyl Dose (mcg/hour)
60-134	25
135-224	50
225-314	75
315-404	100
405-494	125
495-584	150

Oral 24-Hour Morphine Equivalent (mg/day)	Transdermal Fentanyl Dose (mcg/hour)
585-674	175
675-764	200
765-854	225
855-944	250
945-1034	275
1035-1124	300

Figure 33: Calculations for transdermal fentanyl

Equianalgesic Methadone

There are numerous calculation methods for conversion to methadone. One method commonly used in practice is listed below.

Oral 24-Hour Morphine Equivalent (mg/day)	Oral Dose Ratio (Morphine:Methadone)
Greater than 100	3:1
101-300	5:1
301-600	10:1
601-800	12:1
801-1000	15:1
Greater than or equal to 1001	20:1

Figure 34: Equianalgesic Methadone

Resources and References

Pain Information

- International Association for the Study of Pain: <http://www.iasp-pain.org/>
- American Pain Society: <http://americanpainsociety.org/>
- Academy of Integrative Pain Management: <http://www.aapainmanage.org/>
- American Academy of Pain Medicine: <http://www.painmed.org/>
- American Chronic Pain Association: <https://theacpa.org/>
- National Fibromyalgia and Chronic Pain Association: <http://www.fmcpaware.org/>

Institute of Medicine Report

[In 2011, the Institute of Medicine \(IOM\) released a report](#) regarding pain as a public health problem in the United States. The IOM recommended relieving pain become a national priority [9].

National Pain Strategy

In 2016, The U.S. Department of Health and Human Services outlined the nation's first coordinated plan for reducing chronic pain in [The National Pain Strategy \(NPS\)](#). It was developed by a diverse team of experts from around the nation. The National Pain Strategy is a roadmap toward achieving a system of care in which all people receive appropriate, high quality and evidence-based care for pain [10].

CDC Guideline for Prescribing Opioids for Chronic Pain

In 2016, the Center for Disease Control released [the guideline for prescribing opioids for chronic pain](#).

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Guide to the Dental Consult

Oncology, Temporomandibular Disorders, Acute Dental Pain

Dental Evaluation Protocol

- Evaluation
- Staging
- Patient Workup
- Treatment
- Management

Oncology Reference Links

[Comprehensive guide for managing oral complications](#), such as oral mucositis and xerostomia, during cancer treatment from the National Cancer Institute.

[Xerostomia in elderly](#) (Turner M, Ship J. Dry mouth and its effect on the oral health of elderly people. JADA 2007;138:15s-20s.

[Mucositis treatment](#) (Epstein JB, Epstein JD, Epstein MS, Oien H, Truelove EL. Oral doxepin rinse: the analgesic effect and duration of pain reduction in patients with oral mucositis due to cancer therapy. Anesth Analg. 2006 Aug;103(2):465-70, table of contents.

[Oropharyngeal tumor staging](#) (Trotta BM, Pease CS, Rasamny JJ, Raghavan P, Mukherjee S. Oral cavity and oropharyngeal squamous cell cancer: key imaging findings for staging and treatment planning. Radiographics. 2011 Mar-Apr;31(2):339-54.)

[Extra- and intraoral soft tissue exam video](#) from the University of Minnesota)

[Oral examination for Squamous Cell Carcinoma](#) (Epstein JB, Güneri P, Boyacioglu H, Abt E. The limitations of the clinical oral examination in detecting dysplastic oral lesions and oral squamous cell carcinoma. J Am Dent Assoc. 2012 Dec;143(12):1332-42.

Temporomandibular Disorders (TMD)

[TMD exam and treatment recommendations](#)

TMD care: [TMD clicks and locking](#); [TMD self-care therapies](#); [stretching your jaw muscles](#).

Acute dental pain management

[Prescribing recommendations for treating acute dental pain.](#)

Appendix 2: Stretching your Jaw Muscles

People unconsciously stretch many of their muscles throughout the day. Patients who have jaw muscle stiffness or pain often find a significant improvement in their symptoms with this jaw stretching exercise. Your dentist believes your symptoms will improve if you perform this simple jaw stretching exercise six times a day, between thirty and sixty seconds each time, at the opening and duration you determine best for you.

It is best to warm your jaw muscles before you stretch by slowly opening and closing about ten times. You may also warm your muscles by applying moist heat to them (allow time for the heat to penetrate into your muscles). While stretching you need to concentrate on relaxing your lips, facial muscles and jaw. Do not bite your fingers while stretching, they are only to give you a guide for the width you are stretching.

You will need to determine what opening and duration are best for you. To determine this, the first time you stretch, bend your index finger and place the middle knuckle between your upper and lower front teeth (see Figure 1). Hold this position for thirty seconds. If this does not aggravate your symptoms, the second time you stretch, increase the time to forty-five seconds. If this does not aggravate your symptoms, the next time increase it to sixty seconds.



Figure 35

If this does not aggravate your symptoms, increase your opening width to two fingertips (see Figure 2) and cut your time back to thirty seconds.

Continue increasing your time and opening in this manner, but do not go beyond three fingertips.

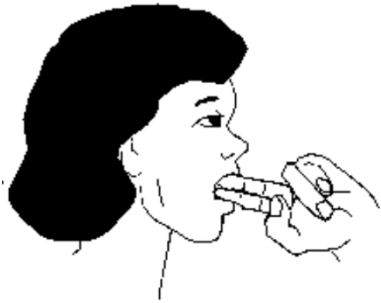


Figure 36

Find the largest opening and duration that does not cause even the slightest discomfort or aggravation of your symptoms and use this each time you stretch. If you experience any discomfort or aggravation, decrease your opening or time.



Figure 37

As your symptoms improve or if you have a flare-up, you will need to increase or decrease this opening and time. Be very careful not to cause yourself any aggravation with this exercise, because this may hurt your progress.

Patients report this exercise does not provide immediate symptom improvement but takes about one to two weeks before benefits are noticed. Similarly, stopping does not cause immediate loss of these benefits, but also tends to take one to two weeks to be noticed. With the normal symptom fluctuation most TMD patients experience, it is often difficult for them to

related their symptom improvement or aggravation with the starting or stopping of this exercise.

Appendix 3: Overview of Clinical Examination for a TM Disorder

The following is an overview of the clinical examination for a TM disorder and the diagnostic criteria and treatment recommendations for specific joint and muscle problems.

CLINICAL EXAMINATION

The TMJs range of motion (ROM) in opening and in lateral movements along with noises should be noted. Observe the pattern of opening; the mandible will deflect towards the joint that is not translating. Ask the patient to point to the areas that are painful during function. The masticatory muscles and the TMJs should be palpated for tenderness and altered texture. Often TMJ tenderness cannot be evaluated until the patient opens slightly, bringing the TMJs from under the zygomatic arch. They are then palpated on the lateral poles. The retrodiscal tissue is then palpated by having the patient open wide and pressing posterior to the condyle or placing your little fingers in their ear and pulling forward. The cervical muscles and spine may be palpated for tenderness; sometimes masticatory pain is primarily due to referred pain from the cervical area.

Intraoral and extraoral swelling or deflection of the soft palate should be appraised. If pulpal pathosis is suspected, the tooth should be tested for a hyper-responsiveness to cold, heat and palpation. If these tests are positive, consider an anesthetic injection of the tooth to determine the impact it may have on the patient's pain complaint. If clenching or bruxism is suspected, significant wear facets, ridging on the lateral borders of the tongue, and/or hyperkeratosis on the cheeks should be observed. Panoramic imaging is warranted when the clinical exam implicates a primary joint problem, a progressive open bite development (suggestive of a decreasing condylar height), or a suspicion that the disorder may be linked to prior trauma. Panoramic or additional imaging may be warranted when the patient does not respond to therapy as anticipated and this information has the potential to change the patient's course of therapy, or if the patient is being evaluated for TMJ surgery.

DIAGNOSTIC CATEGORIES

Identifying the primary and secondary diagnoses are often difficult because TMD disorders tend to have similar symptoms and often occur concurrently. The disc displacement handout provided in the appendix is designed to help explain the mechanics of a TMJ disc displacement to the patient and may also be helpful in explaining a masticatory muscle disorder. The following categories are the diagnostic classifications established by the American Academy of Orofacial Pain. The diagnostic criteria are not meant to be rigid, but rather provide clinical guidance for diagnosis; your clinical judgment should be relied on for final diagnostic decisions.

DIAGNOSTIC CRITERIA FOR JOINT DISORDERS:

1. Congenital or developmental disorders (rarely cause TMD)
 - a. Aplasia faulty or incomplete development of mandible or cranial bone
 - b. Hypoplasia - underdevelopment of mandible or cranial bone
 - c. Hyperplasia – over development of mandible or cranial bone
 - d. Neoplasia - abnormal tissue growth
2. Disc displacement:
 - a. Disc displacement with reduction: 1) reproducible joint noise that occurs at variable positions during opening and closing and 2) soft tissue imaging reveals disc displacement that reduces during opening and hard tissue imaging does not reveal extensive osteoarthritic changes 3) Deviation on opening to the affected side initially but returns to midline upon full opening
 - b. Disc displacement without reduction, acute: 1) persistent marked limited opening (<35 mm) with history of sudden onset, 2) deflection to the affected side upon opening, 3) marked limitation to the contralateral side and 4) soft tissue imaging reveals disc displacement without reduction and hard tissue imaging does not reveal extensive osteoarthritic changes
 - c. Disc displacement without reduction, chronic: 1) history of sudden onset of limited opening that occurred more than 4 months ago and 2) soft tissue imaging reveals disc displacement

without reduction and hard tissue imaging does not reveal extensive osteoarthritic changes.

3. Dislocation (also known as open-lock or subluxation): a) inability to close the mandible without specific manipulative maneuver and b) radiographic evidence reveals condyle well beyond the eminence.
4. Inflammatory disorders:
 - a. Synovitis and capsulitis: 1) TMJ pain increased by palpating the TMJ, loading the TMJ and during function, and 2) hard tissue imaging does not reveal extensive osteoarthritic changes.
 - b. Polyarthritides (joint inflammation and structural changes caused by a generalized systemic polyarthritic condition): 1) pain with function, 2) point TMJ palpation tenderness, 3) limited ROM secondary to pain and 4) hard tissue imaging reveals extensive osteoarthritic changes.
5. Osteoarthritis:
 - a. Primary osteoarthritis (deterioration of subchondral bone due to overloading joint): 1) no identifiable etiologic factor, 2) pain with function, 3) point TMJ palpation tenderness and 4) hard tissue imaging reveals structural bony changes (subchondral sclerosis, osteophyte, or erosion).
 - b. Secondary osteoarthritis (deterioration of subchondral bone due to trauma, infection or polyarthritides): 1) identifiable disease or associated event, 2) pain with function, 3) point TMJ palpation tenderness and 4) hard tissue imaging reveals structural bony changes (subchondral sclerosis, osteophyte, or erosion).
6. Ankylosis:
 - a. Fibrous ankylosis: 1) limited ROM, 2) marked deviation to affected side, c) marked limited laterotrusion to the contralateral side, d) radiographic findings that reveal absence of ipsilateral condylar translation on opening. Bony ankylosis: a) Extreme limited ROM when condition is bilateral, b) marked deviation to affected side, c) marked limited laterotrusion to the contralateral side, d) radiographic evidence of bone proliferation and absence of condylar translation.

Treatment for joint disorders

Management for intracapsular disorders should start with patient education as to the nature of their problem. These are musculoskeletal injuries, which have a strong potential to become chronic because of ever-present jaw function requirements and contributing factors such as parafunction, anxiety and depression. It is very important to have the patient understand their role in limiting function to allow healing (a pain – free diet) and in doing the therapeutic exercises to rehabilitate the joint. They need to be taught how to use medications such as NSAIDS and muscle relaxers to control their symptoms. A short-term steroid regimen such as Medrol Dose Pack (dexamethosone) can be used to initially decrease the symptoms of capsulitis by reducing inflammation.

Physical therapy can be used to reduce inflammation and increase pain free ROM with ice, ultrasound, and phonophoresis. Gentle range of motion exercises should be done by the patient within pain tolerance (it should not hurt more than 10 minutes after the exercise period). Exercises should be done frequently for short periods (6 times a day for 30-60 seconds). The physical therapist can do gentle distraction and mobilization to increase pain free ROM. Iontophoresis can be considered especially if the patient has a good response to a medrol-dose pack.

An orthotic (night guard) can be very effective in reducing forces on the joint to promote healing. It can control parafunctional behavior at night, temporarily stabilize an uneven occlusion, and just allow the joint to rest.

Lastly, a surgical procedure such as arthrocentesis or arthroscopic lysis and lavage can be considered based on the patient's response to reversible treatment. Surgical treatment should only be considered if the patient's complaints are localized to

DIAGNOSTIC CRITERIA FOR MASTICATORY MUSCLE DISORDERS:

1. Myofascial pain: a) regional dull aching pain, generally aggravated by masticatory muscle function b) hyper-irritable sites (trigger points) which can increase and refer the pain. c) moderately limited active ROM which can be increased with passive opening.
2. Myositis: a) pain in a localized muscle following injury or infection, b) diffuse tenderness over the entire muscle, c) increased pain with muscle use and d) moderate to severe limited ROM due to pain and swelling.
3. Myospasm: a) acute pain at rest as well as with function and b) continuous muscle contraction causing a marked decrease in ROM (if involves lateral pterygoid muscle will usually cause malocclusion).
4. Local myalgia: this category is for multiple muscle pain disorders for which we have not yet determined diagnostic criteria, i.e., muscle pain from protective splinting, fatigue, autonomic effects, etc.
5. Myofibrotic contracture: a) limited ROM, b) unyielding firmness on passive stretch, c) little or no pain unless involved muscle is forcibly stretched and d) Pt may have history of trauma, infection or long period of not stretching muscle to its full length.

Treatment involves the use of analgesics and muscle relaxants to initially decrease pain so as to encourage compliance with a home rehabilitation program, and to manage acute relapses. There is no scientific support for the use of these medications long term for muscle pain. Associated headaches need to be adequately managed with abortive and preventative medications as needed. A stabilization dental appliance (occlusal orthosis) should be used to reduce influence of occlusal factors and bruxism when they are present.

Behavior modification should include stress management, relaxation training, coping skill development, and the implementation of habit control regimens to decrease aggravating habits such as nail-biting and daytime clenching. The keys to long term successful management is the elimination of contributing factors such as parafunction, poor sleep, anxiety, depression, occlusal instability, headaches, posture problems.

Physical therapy intervention should initially involve the use of modalities to decrease pain and gentle stretching exercises to keep the joint mobilized and gradually increase jaw opening. The physical therapist or clinician should help the patient develop a home rehabilitation program with stretch and spray, postural-re-education, ergonomic awareness, aerobic exercise, and gentle mobilization. The goal of therapy is a gradual increase of pain free range of motion with home rehabilitation and control of contributing factors. Generally, range of motion increases with muscle problems can be aggressively increased when compared to the increase of range of motion with a primary joint problem. One must go much slower when rehabilitating a joint problem; increasing range of motion within pain tolerance.

RECOMMENDED REFERENCES

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Appendix 4: Self-Care Therapies

We use our mouths for so many activities (talking, eating, yawning, laughing) and when we are not engaged in those, we need to allow our jaw muscles and joints to relax. Many people have developed habits that do not permit their muscles or joints a sufficient amount of time. The following will help instruct you on how to relax your jaw muscles to reduce the jaw pain you are having.

1. Apply moist heat, ice or a combination of heat and ice to the painful areas. Most people prefer heat but if that increases your pain, use the combination or just the ice.
 - a. Use moist heat for twenty minutes two or four times each day. Moist heat can be obtained by wetting a towel with very warm water. It can be kept warm by wrapping it around a hot water bottle or placing a piece of plastic wrap and heating pad over it. It also can be rewarmed in a microwave oven or under the very warm water.
 - b. Use the combination of heat and ice two to four times each day. Apply the heat as recommended above for ten minutes then lightly brush the painful area with an ice cube wrapped in a thin washcloth. Repeat this sequence four or five times.
 - c. Apply ice wrapped in a thin washcloth to the painful area until you first feel some numbness then remove it (usually takes about ten minutes).
2. Eat soft foods like casseroles, canned fruit, soups, eggs and yogurt. Don't chew gum or eat hard (raw carrots) or chewy foods (caramels,

steak, bagels). Cut other food into small pieces, evenly divide the food on both sides of your mouth and chew on both sides.

3. Rest your jaw muscles by keeping your teeth apart and practicing good posture.
 - a. Your teeth should never touch except lightly when you swallow. Closely monitor yourself for the habit of clenching that you may have developed. People will often do this when they are driving the car or concentrating. Try keeping your jaw relaxed by placing your tongue lightly behind your upper front teeth, having your jaw in a comfortable position with your teeth apart and relaxing your jaw muscles.
 - b. Good head, neck and back posture help you to have good jaw posture. Try to hold your head up straight and use a small pillow or rolled towel to support your lower back. Avoid habits as resting your jaw on your hand or cradling the telephone against your shoulder.
4. Avoid caffeine, because it stimulates your muscles to contract and hold more tension in them. Caffeine or caffeine-like drugs are in coffee, tea, most sodas, and chocolate. Decaffeinated coffee also has some caffeine, while Sanka has none.
5. Avoid habits that strain your jaw muscles or joints, such as clenching, grinding or resting your teeth together; biting your cheeks, lips, or objects you put in your mouth; pushing your tongue against your teeth or holding your jaw in an uncomfortable or tense position.

6. Avoid sleeping habits that strain your jaw muscles or joints, by not sleeping on your stomach and if you sleep on your side, keeping your neck and jaw aligned.
7. Restrain from opening your mouth wide, such as yawning, yelling, or prolonged dental procedures.
8. Use anti-inflammatory and pain reducing medications such as ibuprofen (Motrin) naproxen sodium (Aleve) ketoprofen (Orudis KT), acetaminophen (Tylenol), aspirin, and Percogesic to reduce joint and muscle pain. Avoid those with caffeine, i.e. Anacin, Excedrin, or Vanquish.

There is no “cure” for TMD and you may need to follow these instructions for the rest of your life. Your dentist may suggest other therapies in addition to these instructions. No single therapy has been shown to be totally effective for TMS and a percentage of patients receiving TMD therapies report no symptom improvement, i.e., ten to twenty percent of patients receiving occlusal splints report no improvement. Based on your symptoms and identified contributing factors, an individualized treatment approach will be recommended and it may be revised as your symptom response is observed.

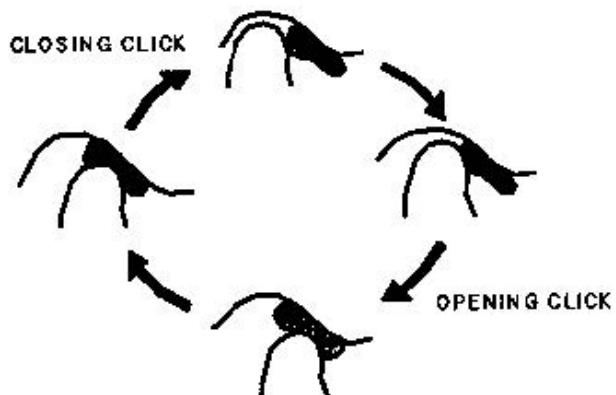
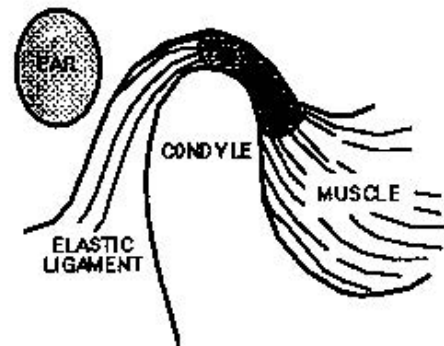
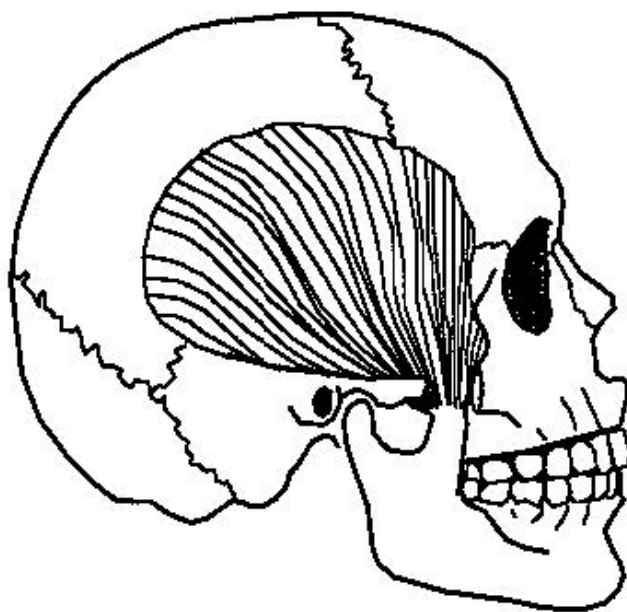
Appendix 5: Anatomy of Clicking TMJ and Locking TMJ

Figure 1 shows the elastic ligament and muscle that attach to either side of the condyle around the temporomandibular joint (TMJ).

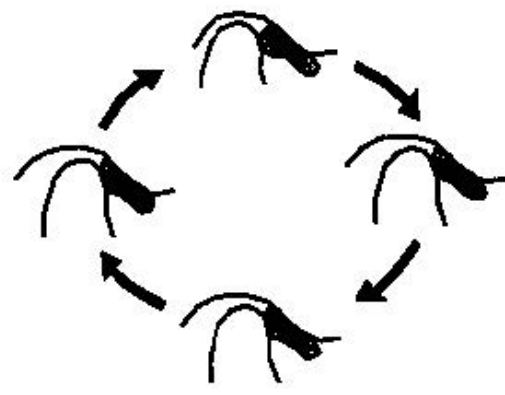
The elastic ligament can be found just below and to the side of the ear canal, connecting the articular disc on one side, while muscle connects on the other side. The mandibular condyle fits between the ligament and muscle, just below the articular disc.

In TMJ, clicking can be heard when the mandibular condyle snaps between the ligament and articular disc.

Locking TMJ occurs when the mandibular condyle gets trapped between the ligament and articular disc.



CLICKING TMJ



LOCKING TMJ

Figure 38

Appendix 6: Opioid Risk Tool¹

¹ Reference: Webster LR. Predicting aberrant behaviors in opioid-treated patients: Preliminary validation of the opioid risk tool. *Pain Medicine*. 2005;6(6):432-442. Used with permission.

Instructions

The Opioid Risk Tool includes five categories:

1. Family history of substance abuse
2. Personal history of substance abuse
3. Age
4. History of preadolescent sexual abuse
5. Psychological disease

The overall score from all five categories score indicates the patient's opioid risk.

1. Family History of Substance Abuse

- Alcohol
 - Item score if female: 1
 - Item score if male: 3
- Illegal Drugs
 - Item score if female: 2
 - Item score if male: 3
- Prescription Drugs
 - Item score if female: 4
 - Item score if male: 4

2. Personal History of Substance Abuse

- Alcohol
 - Item score if female: 3
 - Item score if male: 3
- Illegal Drugs
 - Item score if female: 4
 - Item score if male: 4
- Prescription Drugs
 - Item score if female: 5
 - Item score if male: 5

3. Age

- Age 16-45
 - Item score if female: 1
 - Item score if male: 1

4. History of Preadolescent Sexual Abuse

- Abuse experienced
 - Item score if female: 3
 - Item score if male: 0

5. Psychological Disease

- Attention Deficit Disorder, Obsessive Compulsive Disorder, Bipolar, Schizophrenia
 - Item score if female: 2
 - Item score if male: 2
- Depression
 - Item score if female: 1
 - Item score if male: 1

Total Score Risk Category

- Low Risk: 0 – 3
- Moderate Risk: 4 – 7
- High Risk: ≥ 8