10.6: Non-Opioid Analgesics

Non-opioid analgesics include acetaminophen and nonsteroidal antiinflammatory drugs (NSAIDS).

**Acetaminophen**

**Mechanism of Action**

Acetaminophen inhibits the synthesis of prostaglandins that may serve as mediators of pain and fever primarily in the CNS. \[^1\]

**Indications for Use**

Acetaminophen is used to treat mild pain and fever; however, it does not have anti-inflammatory properties.

**Nursing Considerations Across the Lifespan**

Acetaminophen is safe for all ages and can be administered using various routes.

Geriatric populations should not exceed 3000 mg in 24 hours, and chronic alcoholics should not exceed 2000 mg in 24 hours due to the risk for hepatotoxicity.

**Adverse/Side Effects**

Adverse effects include skin reddening, blisters, rash, and hepatotoxicity.

Severe liver damage may occur if a patient:
• takes more than 4,000 mg of acetaminophen in 24 hours (3200 mg for geriatric adults, 2000 mg for chronic alcoholics)
• takes with other drugs containing acetaminophen
• consumes 3 or more alcoholic drinks every day while using this product. [2]

Some medications are combined with acetaminophen and are prescribed "as needed," so the nurse must calculate the cumulative dose of acetaminophen over the previous 24-hour period. For example, Percocet 5/325 contains a combination of oxycodone 5 mg and acetaminophen 325 mg and could be ordered 1-2 tablets every 4-6 hours as needed for pain. If 2 tablets are truly administered every 4 hours over a 24-hour period, this would add up to 3900 mg of acetaminophen, which would exceed the recommended guidelines for a geriatric patient and could cause liver damage.

If overdose occurs, the antidote is acetylcysteine.

**Patient Teaching & Education**

Medications should be taken as directed and the dosing schedule should be adhered to appropriately. Patients should not take the medication for greater than 10 days. Additionally, patients should avoid taking alcohol while using these medications. If a rash occurs, this should be reported to the healthcare provider and the medication should be promptly stopped. Use of medications may interfere with blood glucose monitoring. If a fever lasts longer than three days or exceeds 39.5 C, this should be reported to the healthcare provider. [3]

Now let’s take a closer look at the medication grid on acetaminophen in Table 10.6a. [4][6][10] Medication grids are intended to assist students to learn key points about each medication. Because information about medication is constantly changing, nurses should always consult evidence-based resources to review current recommendations before administering specific medication. Basic information related to each class of medication is outlined below. Detailed information on a specific medication can be found for free at Daily Med at dailymed.nlm.nih.gov/dailymed/index.cfm. On the home page, enter the drug name in the search bar to read more about the medication. Prototype/generic medications listed in the grids below are also hyperlinked directly to a Daily Med page.

<table>
<thead>
<tr>
<th>Class/Subclass</th>
<th>Prototype-generic</th>
<th>Administration Considerations</th>
<th>Therapeutic Effects</th>
<th>Adverse/Side Effects</th>
</tr>
</thead>
</table>
| Nonopioid analgesic Antipyretic | acetaminophen | Can be given orally, rectally, and IV  
Assess pain prior to and after administration  
Administer with a full glass of water  
Maximum dose over 24-hour period: | Relief of mild pain and fever | Skin reddening  
Blisters  
Rash  
Hepatic failure (liver damage) |
Critical Thinking Activity 10.6a

Your patient is admitted to the hospital with acute liver failure due to acetaminophen toxicity. Your patient reveals that they have had a cold for several days and have been taking over-the-counter cold medications and acetaminophen for a headache. They also mention that every night after work they drink a “few” beers.

What patient education about acetaminophen should be provided?

Note: Answers to the Critical Thinking activities can be found in the “Answer Key” sections at the end of the book.

Nonsteroidal Antiinflammatories (NSAIDs)

Nonsteroidal antiinflammatories have an analgesic effect, as well as antipyretic and anti-inflammatory actions. Some, such as aspirin, also have an antiplatelet effect. Aspirin and other NSAIDs relieve pain by inhibiting the biosynthesis of prostaglandin by different forms of the COX enzyme. COX2 inhibitors are selective and only inhibit the COX-2 enzyme. As a result of the inhibition of COX1 by an NSAID, there is decreased protection of the stomach lining and gastric irritation and bleeding may occur. This section will discuss the following NSAIDs: aspirin, ibuprofen, ketorolac, and celecoxib.\(^6\)

Aspirin

Mechanism of Action

Aspirin produces analgesia and reduces inflammation and fever by inhibiting the production of prostaglandins. It also decreases platelet aggregation.
Indications for Use

Aspirin is used for the treatment of mild pain and fever. Once daily dosages are also used to reduce the risk of heart attack and stroke.

Nursing Considerations Across the Lifespan

Aspirin is safe for adults and children older than 12 years of age.

Adverse/Side Effects

Adverse effects include GI upset, GI bleed, and tinnitus (ringing of the ears).

Allergy alert: Aspirin may cause a severe allergic reaction, which may include:

- hives
- facial swelling
- shock
- asthma (wheezing)

Stomach bleeding warning: This product contains an NSAID, which may cause severe stomach bleeding. The chance for bleeding is higher if a patient:

- takes a higher dose or takes it for a longer time than directed
- takes other drugs containing prescription or nonprescription NSAIDs (aspirin, ibuprofen, naproxen, or others)
- has had stomach ulcers or bleeding problems
- takes a blood thinning (anticoagulant) or steroid drug
- is age 60 or older
- has 3 or more alcoholic drinks every day while using this product

Aspirin is contraindicated if the patient has a bleeding disorder such as hemophilia or a recent history of bleeding in the stomach or intestine.

Patient Teaching & Education

Patients should avoid concurrent use of alcohol while taking medication to avoid gastric irritation. Additionally, they should report tinnitus, unusual bleeding, or fever lasting greater than 3 days to the healthcare provider.

Black Box Warning

Children or teenagers should not take aspirin to treat chickenpox or flu-like symptoms because of the risk of Reye’s Syndrome. Reye’s Syndrome primarily occurs in children in conjunction with a viral illness; it can cause symptoms such as persistent vomiting, confusion or loss of consciousness and requires immediate medical attention.

Now let’s take a closer look at the medication grid on aspirin in Table 10.6b. 

[7][8][9][10]
Table 10.6b Aspirin Medication Grid

<table>
<thead>
<tr>
<th>Class/Subclass</th>
<th>Prototype-generic</th>
<th>Administration Considerations</th>
<th>Therapeutic Effects</th>
<th>Adverse/ Side Effects</th>
</tr>
</thead>
</table>
| Nonopioid analgesic (NSAID) Antipyretic | aspirin | Give orally  
Assess pain prior to and after administration  
Children under 12 years: do not use unless directed by a provider  
Take with a full glass of water and sit upright for 15-30 minutes after administration  
Take with food if the patient reports that aspirin upsets their stomach  
Do not crush, chew, break, or open an enteric-coated or delayed-release pill; it should be swallowed whole  
The chewable tablet form must be chewed before swallowing  
Should be stopped 7 days prior to surgery due to the risk of postoperative bleeding | Treatment of mild pain and fever  
Reduces the risk of heart attack and stroke | GI upset  
GI bleeding  
Tinnitus |

Critical Thinking Activity 10.6b

A patient asks why aspirin is given to prevent a heart attack or stroke.
What is the nurse’s response?

Note: Answers to the Critical Thinking activities can be found in the “Answer Key” sections at the end of the book.

Ibuprofen

Mechanism of Action

Ibuprofen inhibits prostaglandin synthesis.

Indications for Use

Ibuprofen is used to treat mild to moderate pain and fever, inflammatory disorders including rheumatoid arthritis and osteoarthritis, and pain associated with dysmenorrhea.

Nursing Considerations Across the Lifespan

Ibuprofen is safe for infants 6 months or older. It is especially important not to use ibuprofen during the last 3 months of pregnancy unless directed to do so by a doctor because it may cause complications during delivery or in the unborn child.

Adverse/Side Effects

Adverse effects include headache, GI bleed, constipation, dyspepsia, nausea, vomiting, Steven-Johnson syndrome, and renal failure.

Allergy alert: Ibuprofen may cause a severe allergic reaction, especially in people allergic to aspirin. Symptoms may include:

- hives
- facial swelling
- asthma (wheezing)
- shock
- skin reddening
- rash
- blisters

Patient Teaching & Education

Patients should consume the medication with a full glass of water and remain upright for 30 minutes following medication administration. They should avoid the use of alcohol while taking this medication. Patients should be advised to not take the medication for longer than 10 days. If the patient notices rash, visual changes, tinnitus, weight gain, or influenza-like symptoms, these should be reported to the healthcare provider immediately.¹¹

Stomach bleeding warning:

¹¹
This product contains a nonsteroidal anti-inflammatory drug (NSAID), which may cause severe stomach bleeding. The chance for bleeding is higher if the patient:

- is age 60 or older
- has had stomach ulcers or bleeding problems
- takes a blood thinning (anticoagulant) or steroid drug
- takes other drugs containing prescription or nonprescription NSAIDs (aspirin, ibuprofen, naproxen, or others)
- has 3 or more alcoholic drinks every day while using this product
- takes more or for a longer time than directed

**Heart attack and stroke warning:**

All NSAIDs, except aspirin, increase the risk of heart attack, heart failure, and stroke. These can be fatal. The risk is higher if the patient takes more than is directed or takes it for longer than directed.

**Black Box Warning**

Ibuprofen is contraindicated for the treatment of perioperative pain after coronary artery bypass graft.

Now let’s take a closer look at the medication grid on ibuprofen in Table 10.6c. \(^{[12]}\) \(^{[13]}\)

<table>
<thead>
<tr>
<th>Class/ Subclass</th>
<th>Prototype-generic</th>
<th>Administration Considerations</th>
<th>Therapeutic Effects</th>
<th>Adverse/Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nonopioid analgesic</strong></td>
<td><strong>ibuprofen</strong></td>
<td>Given parenterally and orally Assess pain prior to and after administration May take with food or milk if stomach upset occurs Stay well hydrated to prevent renal failure Assess patient for signs of GI bleed Assess for skin rash Monitor BUN, serum creatinine, CBC, and liver function test Do not administer to patients who are allergic to aspirin or other NSAIDs</td>
<td>To relieve mild pain and to reduce fever</td>
<td>Headache GI bleed Constipation Dyspepsia Nausea Vomiting Steven-Johnson syndrome Renal failure</td>
</tr>
</tbody>
</table>
A patient who is a chronic alcoholic asks if it is okay to take ibuprofen for knee pain.

What is the nurse’s best response?

Note: Answers to the Critical Thinking activities can be found in the “Answer Key” sections at the end of the book.

**Ketorolac**

Ketorolac is an NSAID that is commonly used to treat “breakthrough” pain that occurs during the treatment of severe acute pain being treated with opioids.

**Mechanism of Action**

Ketorolac inhibits prostaglandin synthesis.

**Indications for Use**

Ketorolac is indicated for the short-term (up to 5 days in adults) management of moderate to severe acute pain that requires analgesia at the opioid level.

**Nursing Considerations Across the Lifespan**

Ketorolac is safe for adults. This dose should be reduced for patients ages 65 and over.

**Adverse/Side Effects**

Adverse effects include drowsiness, headache, GI bleed, abnormal taste, dyspepsia, nausea, Steven-Johnson syndrome, edema, and renal failure.

**Patient Teaching & Education**
The use of ketorolac may cause dizziness of drowsiness. Patients should also avoid alcohol or other aspirin-containing products unless directed by their healthcare provider. If the patient notices rash, visual changes, tinnitus, weight gain, or influenza-like symptoms, these should be reported to the healthcare provider immediately.\textsuperscript{[14]}

**Gastrointestinal Risk**

Ketorolac tromethamine (IV form) can cause peptic ulcers, gastrointestinal bleeding, and/or perforation of the stomach or intestines, which can be fatal. These events can occur at any time during use and without warning symptoms. Therefore, ketorolac tromethamine is contraindicated in patients with active peptic ulcer disease, in patients with recent gastrointestinal bleeding or perforation, and in patients with a history of peptic ulcer disease or gastrointestinal bleeding. Elderly patients are at greater risk for serious gastrointestinal events.

**Cardiovascular Thrombotic Events**

Nonsteroidal anti-inflammatory drugs (NSAIDs) cause an increased risk of serious cardiovascular thrombotic events, including myocardial infarction and stroke, which can be fatal. This risk may occur early in treatment and may increase with duration of use.

Ketorolac tromethamine is contraindicated for patients who have recently received coronary artery bypass graft (CABG) surgery.

**Renal Risk**

Ketorolac tromethamine is contraindicated in patients with advanced renal impairment and in patients at risk for renal failure due to volume depletion.

**Risk of Bleeding**

Ketorolac tromethamine inhibits platelet function and is, therefore, contraindicated in patients with suspected or confirmed cerebrovascular bleeding, hemorrhagic diathesis, incomplete hemostasis, and a high risk of bleeding. Ketorolac tromethamine is contraindicated as a prophylactic analgesic before any major surgery.

**Hypersensitivity Reactions**

Hypersensitivity reactions ranging from bronchospasm to anaphylactic shock have occurred and appropriate counteractive measures must be available when administering the first dose of ketorolac. Ketorolac tromethamine is contraindicated in patients with previously demonstrated hypersensitivity to ketorolac tromethamine or who have had allergic manifestations to aspirin or other nonsteroidal anti-inflammatory drugs (NSAIDs).

Now let's take a closer look at the medication grid on ketorolac in Table 10.6d.\textsuperscript{[15]}\textsuperscript{[16]}

<table>
<thead>
<tr>
<th>Class/Subclass</th>
<th>Prototype-generic</th>
<th>Administration Considerations</th>
<th>Therapeutic Effects</th>
<th>Adverse Side Effects</th>
</tr>
</thead>
</table>

Table 1.6d Ketorolac Medication Grid

https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/10%3A_Analgesic_and_Musculoskeletal/1…

Updated: Thu, 22 Sep 2022 08:14:25 GMT

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| Nonopioid Analgesic | ketorolac | Given orally, parenterally and as an ophthalmic solution  
Assess pain prior to and after administration  
Therapy should always be given initially by the IM or IV route; then use the oral route as a continuation of parenteral therapy  
Stay well hydrated to prevent renal failure  
Assess patient for signs of GI bleed  
Assess for skin rash  
Monitor BUN, serum creatinine, CBC, and liver function tests  
Do not administer before any major surgery  
Do not administer to patients who are allergic to aspirin or other NSAIDs | To relieve moderate pain short term (not to exceed 5 days)  
Drowsiness  
Headache  
GI bleed  
Abnormal taste  
Dyspepsia  
Nausea  
Steven-Johnson syndrome  
Edema  
Renal failure |

Critical Thinking Activity 10.6d

Ketorolac IV was administered to a patient for severe pain (rated as “8”) due to a back injury.

When should the effectiveness of the medication be evaluated?

Note: Answers to the Critical Thinking activities can be found in the “Answer Key” sections at the end of the book.
**Celecoxib**

Celecoxib is a COX-2 inhibitor.

**Mechanism of Action**

Celecoxib specifically inhibits the enzyme COX-2 that is required for the synthesis of prostaglandins.

**Indications for Use**

Celecoxib is used to treat the pain associated with osteoarthritis, rheumatoid arthritis (including juvenile), and ankylosing spondylitis. It also relieves the pain associated with dysmenorrhea.

**Nursing Considerations Across the Lifespan**

Celecoxib is safe for children 2 years or older. Dosage adjustment is required for patients with hepatic impairment (see Black Box Warning).

**Adverse/Side Effects**

Adverse effects include hypertension, peripheral edema, increased liver enzymes, abdominal pain, dyspepsia, gastroesophageal reflux disease, vomiting, and diarrhea.

There are Black Box Warnings for increased risk of cardiovascular (CV) events and gastrointestinal bleeding, ulceration, and perforation. See more information about each condition below.

**Patient Teaching & Education**

Patients should take medication as directed and use the lowest effective dose for the shortest period of time. If signs of **[17]** GI toxicity occur, these should be reported immediately to the healthcare provider.

**Cardiovascular Thrombotic Events**

Nonsteroidal anti-inflammatory drugs (NSAIDs) cause an increased risk of serious cardiovascular thrombotic events, including myocardial infarction and stroke, which can be fatal. This risk may occur early in the treatment and may increase with duration of use. Celecoxib capsules are contraindicated in patients who have recently received coronary artery bypass graft (CABG) surgery.

**Gastrointestinal Bleeding, Ulceration, and Perforation**

NSAIDs cause an increased risk of serious gastrointestinal (GI) adverse events including bleeding, ulceration, and perforation of the stomach or intestines, which can be fatal. These events can occur at any time during use and without warning symptoms. Elderly patients and patients with a prior history of peptic ulcer disease and/or GI bleeding are at greater risk for serious (GI) events.

Now let’s take a closer look at the medication grid on celecoxib in Table 10.6e. **[18][19]**
<table>
<thead>
<tr>
<th>Class/Subclass</th>
<th>Prototype-generic</th>
<th>Administration Considerations</th>
<th>Therapeutic Effects</th>
<th>Adverse/Side Effects</th>
</tr>
</thead>
</table>
| NSAIDs COX-2 inhibitor | celecoxib | - May be given with or without food  
- May sprinkle capsules on applesauce and ingest immediately with water  
- Monitor patients for signs and symptoms of Steven-Johnson syndrome  
- Monitor for signs and symptoms of GI bleed, hypertension, and heart failure  
- Monitor liver enzymes | - To decrease pain and inflammation caused by arthritis or spondylitis | - Hypertension  
- Peripheral edema  
- Increased liver enzymes  
- Abdominal pain, dyspepsia, gastroesophageal reflux disease, vomiting, and diarrhea  
- Cardiovascular thrombotic events  
- GI bleeding, ulceration and perforation  
- Hepatotoxicity  
- Hypertension  
- Heart failure and edema  
- Renal toxicity and hyperkalemia  
- Anaphylactic reactions  
- Serious skin reactions  
- Hematologic toxicity |
A patient has been prescribed celecoxib for their arthritic pain.

What patient teaching does the nurse plan to provide?

Note: Answers to the Critical Thinking activities can be found in the “Answer Key” sections at the end of the book.
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