From the Editor

The Regional Emergency Medical Services Council of New York City has approved a number of revisions which can be found on the REMSCO website. The revisions can be found using the REMAC Advisories link. Please take careful note of the Advisory Drug Shortages that has an immediate effective date.

Joshua Bucklan, RN, EMT-P
REMAC Liaison
Office of Medical Affairs, FDNY

**All candidates must now meet CME requirements**

- **All REMAC paramedics and candidates should review Certification & CME Information on page 3 journal and plan accordingly.**
- **All upcoming exam candidates**, see registration instructions at the bottom of the last page of this journal.
- **Candidates who will not have a CME letter** at the time of their REMAC exam must email Joshua.Bucklan@fdny.nyc.gov ASAP.
### REMAC Exam Study Tips

**REMAC candidates have difficulty with:**
* Epinephrine use for peds patients
* 12-lead EKG interpretation
* ventilation rates for peds & neonates

**REMAC Written exams are approximately:**
* 12% GOP
* 60% Treatment Protocols
* 12% Appendices
* 16% Scenarios

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### Certification & CME Information

- **By the day of their exam, all REMAC paramedics and candidates must present a letter from their Medical Director verifying fulfillment of CME requirements.**
- **Upcoming candidates without a CME letter ASAP must email** [Joshua.Bucklan@fdny.nyc.gov](mailto:Joshua.Bucklan@fdny.nyc.gov)
- **FDNY paramedics, see your ALS coordinator or Division Medical Director for CME letters.**
- **CME letters must indicate the proper number of hours, per REMAC Advisory # 2007-11:**
  - 36 hours - Physician Directed Call Review
    - **ACR Review**
    - **QA/I Session**
    - **Emergency Department Teaching Rounds** - **Maximum of 18 hours**
  - 36 hours - Alternative Source CME - **Maximum of 12 hours per venue**
    - **Online CME** (see examples below)
    - **Clinical rotations**
    - **Lectures / Symposiums / Conferences**
    - **Associated Certifications** – 4 hours each:
      - **BCLS / ACLS / PALS / NALS / PHTLS**
- **Failure to maintain a valid NYS EMT-P card will suspend your NYC REMAC certification until NYS is recertified.**

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**REMAC certification exams** are held monthly for new and expired candidates, and for currently certified paramedics who may attend up to 6 months before their expiration date.

**REMAC CME and Protocol information** is available and suggestions or questions about the newsletter are welcome. Call 718-999-2671 or email [Joshua.Bucklan@fdny.nyc.gov](mailto:Joshua.Bucklan@fdny.nyc.gov)

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**REMSCO:** [www.NYCREMSCO.org](http://www.NYCREMSCO.org)  
**www.FMINET.com**  [www.statenislandem.com](http://www.statenislandem.com)
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Bayley, Ryan 80314 Isaacs, Doug 80299 Silverman, Lewis 80249
Ben-Eli, David 80298 Jacobowitz, Susan 80297 Soloff, Lewis 80302
Freese, John 80293 Kaufman, Bradley 80289 Van Voorhees, Jessica 80310
Friedman, Matt 80313 Lai, Pamela 80311 Williams, Alan 80316
Giordano, Lorraine 80243 Munjal, Kevin 80308 Zabar, Benjamin 80323
Gonzalez, Dario 80256 Redlener, Michael 80312 Zimmermann, Jason 80324
Hansard, Paul 80226 Reisman, Nathan 80326
Introduction

Stones are not something most people think about in relation to their body, unless they step on one barefoot. However, there are several sites where stones may manifest in the body. These can be thought of as cases where either a substance that is normally a liquid or a dissolved solid, crystalizes into a hard object, or where the body encases an irritating thing to protect itself. In the animal world, when sand gets inside an oyster’s shell, it encases the sand in what becomes a pearl. Unfortunately, when humans have a stone, we don’t get pearls, usually just discomfort. This article will review some of the body’s stones. You will see that many of the medical names have part of the word root containing -lith, which is from Greek meaning stone or rock.

Case Illustration:

A 55-year-old man presents to the EMS crew with recurrent pain in his right flank. The pain is described as sharp, severe, and radiating to the groin, and increases with urination. He also gives a history of blood-tinged urine that occurred one day before the onset of the pain. The patient explains that he has had two similar episodes in the past year. He denies any associated fever, chills, difficulty urinating, bone pain, weakness, or family history of similar symptoms.

Kidney stones

Kidney stones, renal calculi, or nephrolithiasis (all mean the same thing) are common reasons people call EMS or present to the ER. Many people have stones in their kidneys and may not know it, because they usually do not cause pain when just within the kidney. However, when stones pass from the kidney and transit the ureter (uretolithiasis) to the bladder (cystolithiasis), they cause significant pain. Up to 7% of men and 3% of women have kidney stones. There are multiple risk factors, some that are intrinsic to the patient such as sarcoidosis or Crohn’s disease; others are situational such as dehydration. A previous history of the patient or a family member having had a kidney stone in the past is a good predictor that this current pain is caused by a stone.
These stones usually are comprised of **calcium**. Normally, calcium is filtered from the blood in the kidneys, and enters the urine. In the urine, calcium can precipitate into stones (think about if you had sugar in water and you let the water evaporate, the sugar would re-crystalize). Conditions such as hyperparathyroidism that increase concentrations of calcium in the blood lead to more calcium in the urine, and therefore a higher risk of kidney stones. Kidney stones can also be caused by bacteria if the patient has had a urinary tract infection (UTI), or from uric acid. Uric acid causes gout as well, and a high percentage of patients with gout suffer from kidney stones.¹

The biggest factor in the outcome of kidney stones is the **size of the stone**. Small stones cause pain as they irritate the ureter, but the patient eventually can pass them spontaneously in the urine. Larger stones can become stuck, leading urine to back up into the kidney and can cause kidney damage after several weeks. These patients are often in severe pain, writhing around and unable to find a position that makes the pain tolerable. Usually movement or palpation does not make the pain better or worse. If the patient has abdominal tenderness, it is more likely another cause of pain such as appendicitis or a bowel obstruction. (Note: The kidneys and ureters are posterior (retroperitoneal) so palpating the abdomen will not cause a pain response.)
EMS providers should obtain a complete history and physical exam. The main treatment by EMS providers is pain control and assistance with patient movement/transport. ALS providers can provide intravenous pain medication and fluid. Pain medication administration requires a discretionary order since there is no standing order for narcotics in abdominal or flank pain in REMAC protocols. Other causes of severe back pain should be considered, such as aortic dissection or kidney infection (pyelonephritis).

Once the patient is in the Emergency Department, a urinalysis is very helpful since most cases will display **hematuria** (blood in the urine). Often the patient will get radiologic imaging. CT scans have the advantage of measuring the size of the stone and locating it, which can help plan treatment. A large stone that the patient will be unlikely to pass may need to be removed by a urologist or broken up using ultrasound (lithotripsy). For some large stones, a stent is placed in the ureter to hold the ureter open so urine can get past the stone. Ultrasound is sometimes used instead of a CT scan since it doesn’t require radiation, but it is less likely to actually see the stone. Sometimes an unassuming ultrasound combined with improvement in pain, especially in patients with a previous history of kidney stones, may allow the patient to be discharged from the ED for outpatient urology follow up.

In the ED, kidney stones are treated with pain control, often non-steroidal anti-inflammatories (NSAIDs) such as ketorolac (Toradol), which is similar to ibuprofen. This is not given in the field at this time, in part because NSAIDs can cause platelet dysfunction and worsen bleeding. Therefore, if the patient actually has appendicitis and needs to have emergency surgery, it is preferred that the patient did not receive NSAIDs. For more severe pain, ED providers also give opioids such as fentanyl or morphine. IV fluids are often given, though there is debate if fluids hasten expulsion of stones. Traditionally, tamsulosin (Flomax) was given to help expel stones. As an alpha-1 blocker, the idea was that it relaxed the smooth muscle of the ureter helping the stones pass. Recent studies have not found an improvement in stone passage with tamsulosin; some emergency physicians and urologists have stopped using it for kidney stones, while others still do so. Patients who have had a kidney stone in the past, have a 60-80% chance of having another in the future.  

**Gallstones**

The liver produces bile, which assists the body to absorb fat and fat-soluble vitamins from the intestines. Bile moves through bile ducts, some directly into the intestines and some into the gallbladder. The gallbladder is a sack-like structure inferior to the liver where the bile is stored until needed. In response to eating meals especially high in fat, the gallbladder contracts and the bile is excreted into the intestine. Gallstones, or cholelithiasis, can form as crystallizations of solutes in bile, such as cholesterol based stones. Imagine you have a jar of honey that is left out for a while. Eventually the honey starts to solidify and crystallize, similar to the gallstones forming. There are other types of stones known as pigmented stones, which can form from calcium and bilirubin, or from infections. Approximately 20% of women and 8% of men have gallstones, which are asymptomatic in a number of people. Risk factors for gallstones include female sex, obesity,
Caucasian, increased age, fertility, and family history. Some of these risks are remembered as the “five Fs”: female, fat (overweight), fertile (premenopausal), forty (age near or above 40), fair (Caucasian). While the Fs provide an easy way to remember the risk factors, they obviously **should not be shared with the patient**, as it can be considered insulting.

The stones may cause pain as they pass into the common bile duct, sometimes becoming stuck. If they block the exit of pancreatic enzymes, they can cause pancreatitis. Patients typically have pain in the right upper quadrant, but the pain can radiate to the right shoulder, or the flank. Pain is often worse after eating, especially after eating meals high in fat. With pain of the right upper quadrant, cholecystitis is a concern. This is inflammation or infection of the gallbladder and often is associated with gallstones. Other possible causes of pain include colitis (inflammation of the large intestines), hepatitis which is inflammation of the liver caused by infection such as hepatitis C or cirrhosis. Appendicitis can even present as right upper quadrant pain, depending on where the appendix tip is located in the abdomen (though more classically it is right lower quadrant pain.)

EMS providers should take a thorough history and perform a physical exam, including inspection, auscultation, and palpation of the abdomen. Follow abdominal pain protocols; do not let the patient eat or drink. ALS providers can consider calling for discretionary pain control orders for severe pain. Note that historically doctors were reluctant to give pain medication for abdominal pain out of fear it may make diagnosis more difficult, but it has been shown that pain control does not hamper physical exam. No longer is pain medication withheld in the ED to await surgical exam or imaging. Pain control is an important part of hospital management. Blood tests are done to check for elevations of liver function tests, which may indicate liver failure or hepatitis. **Lipase** is checked to look for pancreatitis. **Bilirubin**, which is a breakdown product of red blood cells, is excreted in bile and an elevation may indicate gallbladder pathology. Imaging is the most accurate way to diagnose gallstones. If strong suspicion for gallbladder pathology, the ED will often start imaging with an ultrasound of the right upper quadrant of the abdomen. If the cause is less clear, a CT scan is usually ordered first, as it will rule out other causes such as bowel obstruction or appendicitis. If the CT scan indicates problems with the gallbladder, often an ultrasound is done afterwards, as this is...
more sensitive for cholecystitis. Sometimes a nuclear medicine study, a HIDA scan, is done to evaluate the gallbladder for cholecystitis. Treatment depends on the pathology. For cholecystitis, the patient gets antibiotics and pain control and usually is scheduled for removal of the gallbladder (cholecystectomy). For gallstones without cholecystitis, if the pain can be controlled, the patient is discharged for outpatient follow up and surgical consultation for possible cholecystectomy in the future, depending on severity of symptoms and other surgical considerations. Patients with severe pain who do not improve sufficiently to be discharged may be admitted for more urgent cholecystectomy. This operation traditionally was done with a large incision in the right upper quadrant, but newer laparoscopic techniques (using a camera) can remove the gallbladder through a series of small incisions. One incision is used to insert a camera into the abdominal cavity, which is distended with carbon dioxide. Other small incisions are used to insert surgical instruments to cut away the gallbladder, which is then removed through a port. In some centers, the whole procedure can be done through a single incision in the belly button (umbilicus)!

**Bezoars**

A bezoar (pronounced BE-zor) is a mass of indigestible food or nonfood material caused by ingesting these substances. One type of bezoar is caused from ingested hair (trichobezoar). These patients have an urge to pull their hair (trichotillomania – hair-pulling disorder) and swallow it (trichophagia). This condition is typically seen in patients with history of psychiatric issues and in children with mental retardation. As a result, a large mass of hardened hair can form in the stomach, causing a distended abdomen (see CT image on left) and may even cause obstruction, due to the body’s inability to break down keratin, the protein in hair. Other bezoars can be made up of vegetable matter, fungi (from infection), and milk curds. Bezoars were discovered long ago in the stomachs of animals and were believed to have healing power, and up until the 18th century, were used as antidotes to poisoning in humans. They were so valued in medieval Europe that they were sometimes worn as jewelry (see “bezoar stone,” to the right).

While bezoars may occur with normal gastric anatomy and physiology, they are a more often a complication in patients with previous gastric surgery or altered GI tracts (ex. slower motility). Patients may present with abdominal pain, nausea, vomiting or other abdominal symptoms. They should be treated consistent with abdominal pain protocols and transported for further evaluation. Bezoars are often discovered on imaging such as CT scan or during endoscopy (when a camera is passed into the stomach under sedation). Sometimes they can be removed during the endoscopy or dissolved with enzymes.

**Sialolith**

These are stones in the salivary glands, which occur in about 1% of the population, and they can
become entrapped causing pain and swelling of the gland. These stones are caused by the body calcifying an organic nidus (nucleus). “Infection, inflammation, salivary stagnation, physical trauma, introduction of foreign bodies and the presence of desquamated epithelial cells seem to be the events for the formation of a nidus that later will be the site for the precipitation of mineral salts contained in the salivary secretion.\(^6\) Most of these stones occur in the **submandibular gland** (in the bottom of the jaw). Stones may be more common in this gland because salivary needs to fight gravity to get to the mouth, making it harder to expel stones.\(^7\) Other things that can cause swelling of the glands include bacterial infections, viruses (especially mumps, so asking about childhood immunizations is important), and malignancies (cancer).\(^8\)

EMS providers should assess the patient for airway compromise due to swelling or drooling, place patient in position of comfort, and transport to appropriate facility.

In the hospital, patients can be evaluated with ultrasound or CT scan. Treatment usually includes pain control, antibiotics, and inducing salivation by having the patient suck on hard candies. When this does not work to help remove the stone, the stone may have to be removed by an ENT doctor or broken up with sound waves (lithotripsy).

**Otoliths**

These are actually a normal part of your vestibular system, which is used by the body to detect movement (by detecting acceleration) and positioning of the head. These otoliths are “stones” of calcium that are in the Utricle and Saccule.

[Diagram of the vestibular system]

When the head tilts or accelerates, these stones move in relation to “hair cells.” This movement causes the hair cells to send signals via nerves to the brain. This system is important for balance and eye movement (helps the eyes track while you are moving, say running to catch a football. This system helps compensate for your movement so the image of the ball appears to move less than otherwise).

Problems with these otoliths can be a cause of vertigo, which is the sensation that the patient or room is moving. Often this causes nausea, inability to walk, and extreme discomfort. There are maneuvers that can be tried in the ED to move the head in certain ways to attempt to reposition these stones.
Keep in mind that patients experiencing vertigo may describe their complaint as “dizziness.” Dizziness can also be the chief complaint given when patients are experiencing lightheadedness, weakness, off-balance, or even having a headache or fever. Each of these may have very different medical etiologies, so it is important to clarify exactly what the patient is experiencing.

The most concerning cause of vertigo is stroke. CVAs of the posterior part of the brain can cause intense vertigo. The posterior blood supply of the brain supplies the cerebellum, which coordinates balance and movement. Often causes of vertigo from the brain do not worsen with movement. More “peripheral” causes, such as ear infections or problems of the inner ear, often get worse with head movement, though this is not completely specific to differentiate the cause. It is important to do a good neurological exam, as other deficits such as weakness or decreased sensation would be more concerning for a serious cause of the vertigo. If there is a concern for a central (from the brain) cause of the symptoms, a CT scan will be done. Once more serious causes of vertigo have been ruled out, treatment such as meclizine can be tried.

**Conclusion**

There are multiple sites in the human body where stones can form. Some, such as kidney stones, are common causes for EMS calls; others such as bezoars are rare. The history of present illness describing the onset, location and characteristics of pain (OPQRSTI) are all part of the initial assessment. Consideration of past medical history, dehydration, last oral intake, changes in urination and bowel movements, NSAID and alcohol use, risk factors and family history may help narrow the focus in formulating the presumptive diagnosis. Ultimately, many of these conditions are quite painful which makes patient movement difficult, so for the patient’s benefit, BLS crews may request ALS for discretionary pain management.

**References**


Submitted by: **DR. BENJAMIN ZABAR**
Office of Medical Affairs
May 2017 Journal CME Quiz – “Stones of the Body”

1. Men are more likely to suffer from gallstones than women?
   a. True
   b. False

2. Which is present in the majority of patients with pain from kidney stones?
   a. hematuria
   b. hematochezia
   c. hemarthrosis
   d. hemoglobin

3. Bezoars are often identified during what procedure?
   a. laryngoscopy
   b. arthroscopy
   c. colonoscopy
   d. endoscopy

4. Which of the below findings on a blood test often indicates that the patient could have gallbladder pathology?
   a. elevated sodium
   b. elevated bilirubin
   c. low platelets
   d. low fibrinogen

5. Treatment of sialoliths may involve which of the following?
   a. stimulating saliva production
   b. jaw immobilization
   c. emergency surgery
   d. hyperbaric oxygen

6. Which word fragment that indicates “stones” in medical terminology?
   a. -centesis
   b. -lith
   c. -capnea
   d. -lysis

7. Gallstones can cause which of the following problems?
   a. arthritis
   b. endocarditis
   c. pancreatitis
   d. tenosynovitis

8. Bile assists the body in absorption of which of the following?
   a. fat
   b. protein
   c. glucose
9. What is the most common component of kidney stones?
   a. magnesium
   b. sodium
   c. potassium
   d. calcium

10. Problems with otoliths can cause which of the following?
    a. abdominal pain
    b. flank pain
    c. hematuria
    d. dizziness
Based on the CME article, place your answers to the quiz on this answer sheet.
Respondents with a minimum grade of 80% will receive 1 hour of Online/Journal CME.

Please submit this page only once, by one of the following methods:
• FAX to 718-999-0119 or
• MAIL to FDNY OMA, 9 MetroTech Center 4th flr, Brooklyn, NY 11201

Contact the Journal CME Coordinator at 718-999-2790:
• three months before REMAC expiration for a report of your CME hours.
• for all other inquiries joshua.bucklan@fdny.nyc.gov.

Monthly receipts are not issued. You are strongly advised to keep a copy for your records.

Note: if your information is illegible, incorrect or omitted you will not receive CME credit.

check one:  • EMT  • Paramedic  • ____________________  • other

Name

NY State / REMAC # or “n/a” (not applicable)

Work Location

Phone number

Email address

Submit answer sheet by the last day of
July 2017

May 2017 CME Quiz

1.
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10. Questions 1-10 for all providers
Regional CME – Sessions are subject to change. Please confirm through the listed contact.

See other opportunities at [www.nycremsco.org](http://www.nycremsco.org) under News & Announcements

**Note:** A potential source of Call Review is E.D. Teaching Rounds (maximum of 18 hours)

See any hospital E.D. Administrator for availability (especially HHC hospitals)

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<td>Mike Skovira <a href="mailto:Mskovira@northwell.edu">Mskovira@northwell.edu</a></td>
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<td>contact to inquire →</td>
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<td>Eunice Wright <a href="mailto:eunice.wright@mountsinai.org">eunice.wright@mountsinai.org</a></td>
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<td>Steven M. Samuels 212-746-0596</td>
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<td></td>
<td>NYU School of Medicine</td>
<td>contact to inquire →</td>
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<td><a href="mailto:danielle.milbauer@nyumc.org">danielle.milbauer@nyumc.org</a></td>
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<td>A1-22 Auditorium 3rd Wednesdays, 0830-0930</td>
<td>Anju Galer RN 718-334-5724 <a href="mailto:galera@nychhc.org">galera@nychhc.org</a></td>
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<td>Mt Sinai Qns</td>
<td>Call Review</td>
<td>25-10 30 Ave, conf room last Tuesdays, 1800-2100</td>
<td>Donna Smith-Jordon 718-267-4390</td>
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<td></td>
<td>NYH Queens</td>
<td>contact to inquire →</td>
<td>East bldg, courtyard flr</td>
<td>Mary Ellen Zimmermann RN 718-670-2929</td>
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<td>Call Review</td>
<td>Emergency Dept 2nd &amp; 4th Thurs 1615-1815</td>
<td>Maria Jones or Julia Fuzailov 718-883-3070</td>
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<td>St John’s University</td>
<td>contact to inquire →</td>
<td>175-05 Horace Harding Expwy</td>
<td>718-990-8436 <a href="http://www.stjohns.edu/ems/cme">www.stjohns.edu/ems/cme</a></td>
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<td>1st floor Board Room</td>
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<td>Tony McKay NRP <a href="mailto:amekav@rumcsi.org">amekav@rumcsi.org</a></td>
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<td>Holly Acierno RN <a href="mailto:hacierno@SIUH.edu">hacierno@SIUH.edu</a></td>
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See any hospital E.D. Administrator for availability (especially HHC hospitals)
### 2017 NYC REMAC Examination Schedule

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<sup>1</sup> REMAC Refresher examination is offered for paramedics who meet CME requirements and whose REMAC certifications are either current or expired less than 30 days. To enroll, go to the REGISTER link under “News & Announcements” at [nycremsco.org](http://nycremsco.org) before the registration deadline above. Candidates may attend an exam no more than 6 months prior to expiration.

<sup>2</sup> REMAC Basic examination is for initial certification, or inadequate CME, or certifications expired more than 30 days. Seating is limited. Registrations must be postmarked by the deadline above. Exam fee by $100 money order to NYC REMSCO is required. All Basic candidates must meet new education requirements. Email [Joshua.Bucklan@fdny.nyc.gov](mailto:Joshua.Bucklan@fdny.nyc.gov) for instructions.

<sup>3</sup> NYS/DOH exam dates are listed for information purposes only. Scheduling is through your paramedic program or contact NYS DOH for more information.