



1999 Update: Rethinking the Myths of Emergency Medicine

There are many “myths” in medicine, and this is certainly true of emergency medicine. Many common medical myths will be described in this course, along with the scientific evidence that refutes them. Do you still subscribe to any of these practices? How do you determine which ones are scientifically valid and which ones are not? The presenter will guide you through methods of determining their validity.

- Discuss the widely held beliefs of emergency medicine that have been analyzed in the literature.
- Discuss practice patterns and why we perpetuate certain beliefs.
- Discuss the alternatives to widely held, yet not scientifically valid, clinical beliefs.

TU-103
Tuesday, October 12, 1999
3:00 PM - 4:55 PM
Room # N247
Las Vegas Convention Center

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1999 Update: Rethinking the Myths of Emergency Medicine

ACEP Scientific Assembly

**Las Vegas Convention Center
Las Vegas, Nevada
October 10-13, 1999**

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Myth

1. A popular belief or tradition that has grown up around something
2. A point of view or tenet put forth as authoritative without adequate grounds

Ectopic Pregnancy

Value of ultrasound when the HCG is < 1000

A common misconception is that a low HCG represents an early IUP or an abnormal pregnancy and that nothing will be visible on ultrasound. In fact, ectopic pregnancies often have a peak HCG < 1000, and a significant percentage of these are visible on ultrasound. A corollary to this myth is that ectopic rarely rupture below an HCG of 1000, and therefore patients with low HCGs can be managed expectantly. A 1989 study of 131 ectopics found 2 ruptured with an HCG of < 100, and 11 < 300. A case report from 1987 of a ruptured ectopic with life-threatening hemorrhage and an undetectable HCG (<15 with their assay) will help you sleep better at night. The most dangerous ectopic, the cornual ectopic with its high potential for serious hemorrhage, is the most likely to have a low peak HCG. It appears that ultrasound factors such as the endometrial stripe thickness (Dart, Acad Emerg Med 1999), may identify a high risk subset of patients with HCG < 1000. Bottom line: a patient with symptoms consistent with ectopic pregnancy deserves an ultrasound, regardless of the HCG.

Dart RG, Dart L, Mitchell P, Berty C. The predictive value of endometrial strip thickness in patients with suspected ectopic pregnancy who have an empty uterus at ultrasonography. *Acad Emerg Med* 1999;6:602-608.

Dart RG, et al. Transvaginal ultrasound in patients with low beta-human chorionic gonadotropin values: how often is the study diagnostic? *Ann Emerg Med* 1997;30:135

Daus K, et al. Ectopic pregnancy. What to do during the 20-day window. *J Reprod Med* 1989;34:162

DiMarchi et al. What is the significance of the human chorionic gonadotropin value in ectopic pregnancy? *Obstet Gynecol* 1989;74:851

Lonky NM, et al. Ectopic pregnancy with shock and undetectable beta-human chorionic gonadotropin. A case report. *J Repro Med* 1987;32:559.

The falling hCG and ectopic pregnancy

Ectopic pregnancies typically have a slower than normal rise in HCG, and an increase in hCGs of <66% when drawn 48 hours apart is highly suspicious. The common expressed thinking that a falling hCG likely indicates a failed pregnancy and an impending spontaneous abortion is

correct, but it is important to keep in mind that the majority of ectopics have a falling hCG at diagnosis.

Daus K, et al. Ectopic pregnancy. What to do during the 20-day window. *J Reprod Med* 1989;34:162

The heterotopic pregnancy rate

The often cited 1:30000 rate dates from a 1948 paper that calculated the rate from a number of assumptions. Things are very different in the 1990s, most importantly the overall rate of ectopic pregnancy. It has risen from 4.2/1000 reported pregnancies in 1970 to 19.8/1000 in 1992, and a concomitant rise in heterotopics is inevitable. A 1984 study pegged the rate at 1:3000 to 1:5000. The numbers are certainly worse in 1998 with the continued rise in the ectopic rate and the advent of widespread in vitro fertilization and other infertility procedures. Because of the force of embryo injection and injection of multiple embryos, tubal pregnancies are common in IVF. One study estimates that 1-5% of all IVF pregnancies are heterotopic. This is obviously a critical fact which radically changes our thinking about the finding of an definite IUP in these patients.

Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Center for Disease Control, Atlanta, 1993.

Hann LE, et al. Coexistent intrauterine and ectopic pregnancy: a reevaluation. *Radiology* 1984;152:151

Svare J, et al. Heterotopic pregnancies after in-vitro fertilization and embryo transfer—a Danish survey. *Hum Reprod* 1993;8:116

Progesterone in early pregnancy

A growing body of literature is demonstrating the value of the serum progesterone in distinguishing between a early normal pregnancy and an abnormal pregnancy when the hCG is low. Unfortunately, the overlap in serum levels between ectopic and other abnormal pregnancies limits the usefulness of the test for making that important distinction. It does appear that a cutoff can be chosen which will identify patients at very low risk for ectopic, obviating the need for further workup.

Mol BW, Lijmer JG, Ankum WM, et al. The accuracy of single serum progesterone measurements in the diagnosis of ectopic pregnancy: a meta-analysis. *Human Reprod* 1998;13:3220-3227.

Dart R, et al. The ability of a single serum progesterone value to identify abnormal pregnancies in patients with beta-human chorionic gonadotropin values less than 1,000 mIU/mL. *Acad Emerg Med* 1998;5:305

Valley VT, et al. Serum progesterone and endovaginal sonography by emergency physician in the evaluation of ectopic pregnancy. *Acad Emerg Med* 1998;5:309

Other ectopic fun facts

The physical exam is a poor detection tool. Only 60% had a palpable mass in the adnexa in one study, and another study found that a third of the palpated masses were actually a corpus luteum on the side opposite the ectopic. As has been reported for traumatic hemoperitoneum, tachycardia is often not present in the setting of ruptured ectopic with significant blood loss, with the obvious implications for triage and early evaluation of women with lower abdominal pain.

Dart RG, Kaplan B, Varaklis K. Predictive value of history and physical examination in patients with suspected ectopic pregnancy. *Ann Emerg Med* 1999;33:283-290.

Pagano R. Ectopic pregnancy: a seven year survey. *Med J Aust* 1981;2:586

Snyder HS. Lack of a tachycardiac response to hypotension with ruptured ectopic pregnancy. *Am J Emerg Med* 1990;8:23

Weckstein LN. Clinical diagnosis of ectopic pregnancy. *Clin Obstet Gynecol* 1987;30:236

Gastric Lavage

Although the routine induction of emesis has fallen into disfavor, the belief that gastric lavage should be performed on all significant ingestions still exists. There is no proven benefit to gastric lavage and lavage has well documented complications. The perceived usefulness of gastric emptying has waxed and waned over the last 200 years. Prior to 1822, induction of emesis with a variety of agents (zinc sulfate, mustard powder, ipecacuanha extract) was standard medical therapy. Articles by Jukes and Bush in 1822 demonstrated greater recovery of ingested substances with gastric lavage than with emesis. This concept was widely accepted and lavage became the standard of care for the next 150 years. In 1969 Boxer studied aspirin overdoses in children. He found induction of emesis with ipecac to be twice as effective as lavage. Induction of emesis then became widely used for most overdoses.

The superiority of ipecac over lavage was questioned in the 1980's in several papers (Tandenberg, Auerbach). Lavage was demonstrated to be more effective than ipecac though significant amounts of ingested drug were recovered with each method. In both of these papers however, gastric emptying was carried out within 10 minutes of ingestion. There remains a question as to the effectiveness of gastric emptying in the usual clinical situation where it is not accomplished for an hour or more after the overdose has occurred. Several studies (Shrestha) have shown that the amount of drug recovered by gastric emptying rapidly decreases after the first hour.

Recent studies (Kulig, Pond) have investigated the effect of ipecac or

lavage on clinical outcome. They showed no benefit to gastric emptying either with "mild" or "severe" overdoses. Complications from gastric emptying are well demonstrated and include aspiration (even in intubated patients), oral and pharyngeal trauma, perforation of the esophagus or stomach, displacement of stomach contents through the pylorus and delay in giving activated charcoal.

Auerbach PS, et al: Efficacy of gastric emptying: Gastric lavage versus emesis induced with ipecac. *Ann Emerg Med* 15:692-698, 1986

Bateman DN, Gastric decontamination –a view for the millennium. *J Accid Emerg Med* 16:84-6, 1999

Kulig K, et al: Management of acutely poisoned patients without gastric emptying. *Ann Emerg Med* 14:562-67, 1985

Manoguerra AS: Gastrointestinal decontamination after poisoning. *Crit Care Clin* 13:709-25, 1997

Merigian KS, et al: Prospective evaluation of gastric emptying in the self-poisoned patient. *Am J Emerg Med* 8:479-83, 1990

Pond SM, et al: Gastric emptying in acute overdose: a prospective randomized controlled trial. *Med J Aust* 163:345-349, 1995

Shrestha M, et al: A comparison of three gastric lavage methods using the radionuclide gastric emptying study. *J Emerg Med*, 14:413-418, 1996.

Tandberg D, et al: Ipecac-induced emesis versus gastric lavage: A controlled study in normal adults. *Am J Emerg Med* 4:205-209, 1986

Tenebein, M, et al: Efficacy of ipecac-induced emesis, orogastric lavage, and activated charcoal for acute drug overdose. *Ann Emerg Med* 16:838-41, 1987

Young WF, Bivens HG: Evaluation of gastric emptying using radionuclides: gastric lavage versus ipecac-induced emesis. *Ann Emerg Med* 22:1423-27, 1993

Analgesic Use In Patients with Abdominal Pain

There is a common belief that pain medications can't be given to the patient with abdominal pain until after a diagnosis has been made. This leads to delays in administration of analgesics. The latest edition of Cope's Diagnosis of the Acute Abdomen states "there is no doubt that the giving of opioids by a physician not responsible for the ultimate diagnosis and therapy may lead to serious delay and error in decision making." Recent studies cast doubt on that statement. There is evidence that titrated doses of opioids can lessen pain without altering the physician's ability to detect disease.

Zoltie performed a randomized double blind, placebo controlled study in 288 patients treated with buprenorphine. He found no change in the diagnosis or outcome in treated patients. The study was criticized because

patients who received the opiate experienced little relief of pain. Attard performed a randomized, double blind, placebo controlled study using the equivalent of 12.5 mg morphine in patients with significant abdominal pain. He found that pain medication not only relieved the pain but also facilitated a correct diagnosis. Recently Pace in a study of 71 patients confirmed the concept that morphine could relieve pain without altering the ability to perform accurate evaluations.

Administering analgesia to abdominal pain patients in the ED is best performed by implementing a policy developed jointly by emergency physicians and the consulting surgery service. Surgeons should acknowledge that a passive policy of "waiting for the surgeon" prolongs pain without providing any clear benefit to the patient. The policy should address:

1. who is eligible for analgesia
2. which agents are to be used
3. frequency of administration
4. desired endpoint

Once the policy has been established, careful auditing of cases will allow it to be further refined.

Attard AR, et al: Safety of early pain relief for acute abdominal pain. *BMJ* 305:554-56, 1992

Graber MA, et al: Informed consent and general surgeons attitudes toward the use of pain medication in the acute abdomen. *Amer J Emerg Med* 17:113-6, 1999

Pace S, Burke TF: Intravenous morphine for early pain relief in patients with acute abdominal pain. *Acad EM* 3:1086-92, 1996

Tait IS: Do patients with acute abdominal pain wait unduly long for analgesia? *J R Coll Surg Edinb* 44:181-4, 1999

Yealy DM, O'Toole KS: Challenging dogma--analgesia in abdominal pain. *Acad EM* 3:1081-2, 1996

Zoltie N, Cust MP: Analgesia in the acute abdomen. *Ann Royal Col Surg Eng*, 68:209-10, 1986

Acute Coronary Syndrome

Risk stratification value of the normal EKG

While it is true that a high percentage of MIs are not apparent on the initial EKG, a truly normal EKG has significant risk stratification value. The negative predictive value varies significantly with different criteria. Using the narrow criteria of no ST or T changes or Q waves, old or new, the NPV for MI in the subsequent month is 99% (Lee). Defining normal even more tightly by eliminating LVH, LBBB, and paced rhythm found a negative

predictive value of 99.8% for life-threatening complications in group of chest pain patients admitted to the hospital for workup (Cohen).

Brush JE Jr., et al. Use of the initial electrocardiogram to predict in-hospital complications of acute myocardial infarction. *N Engl J Med* 1985;312:1137

Cohen M, et al. Usefulness of ST-segment changes in greater than or equal to 2 leads on the emergency room electrocardiogram in either unstable angina pectoris or non-Q-wave myocardial infarction in predicting outcome. *Am J Cardiol* 1991;67:1368

Lee TH, et al. Acute chest pain in the emergency room. Identification and examination of low-risk patients. *Arch Intern Med* 1985;145:65

Rouan GW, et al. Clinical characteristics and outcome of acute myocardial infarction in patients with initially normal or nonspecific electrocardiograms (a report from the Multicenter Chest Pain Study). *Am J Cardiol* 1989;15:1087

Value of the Framingham risk factors in evaluating chest pain

The five classic coronary artery disease risk factors of diabetes, hypertension, family history, smoking, and hypercholesterolemia convey lifetime risk of coronary artery disease. They have little or no risk stratification value for evaluating the likelihood of ACS in a chest pain patient. In study of 5773 chest pain patients in 6 EDs, there was no significant increased risk of ACI in women from any of the risk factors, and the ORs of 2.4 and 2.1 for diabetes and family history in men were overwhelmed by the OR of 12.1 for having a chief complaint of chest pain and 8.7 and 5.3 for any ST or T abnormalities.

Jayes RL Jr., et al. Do patients' coronary risk factor reports predict acute cardiac ischemia in the emergency department? A multicenter study. *J Clin Epidemiol* 1992;45:621

The implications of normal serial cardiac markers in chest pain patients

It is important to remember that all the currently available markers are markers of infarction ONLY. A patient with ACS without infarction may have an very high risk of a near-term serious cardiac event (infarction, sudden death or serious arrhythmia) yet have normal serial markers. All risk stratification tools available should be brought into play in making the admission/discharge decision, not just the markers. Additionally, the CK-MB has significant normal background and therefore is relatively insensitive to small infarctions. Because the cardiac troponins have are normally undetectable in serum, they will pick up small areas of injury that would previously have gone undetected, yet increase the patient's risk of a serious event. How we use the "intermediate" or low positive cTnI and cTnT in clinical practice remains to be defined, but they clearly connote an increased risk of near-term significant cardiac events.

Antman EM, et al. Cardiac-specific troponin I levels to predict the risk of mortality in patients with acute coronary syndromes. *N Engl J Med* 1996;335:1342

Ohman EM, et al. Cardiac troponin T levels for risk stratification in acute myocardial ischemia. GUSTO IIA Investigators. *N Engl J Med* 1996;335:1333.

The Reimbursement System

The belief that the Federal Reimbursement System for emergency medicine is logical and fair is open to question. It is possible to care for a patient in an observation unit for two minutes and be reimbursed for two days of service. Multiple lacerations are each reimbursed at different rates (100% then 50% then 50% then 25%). Critical care "hours" seem to have been created by Lewis Carroll. The first critical care "hour" lasts 74 minutes, the next "half hour" is 29 minutes and the "half hour" after that lasts 34 minutes. New ambulatory patient groups (APGs) are the next step to follow DRG's. Presently APG's define a "single patient encounter" as any service provided during "three contiguous dates of service." It is possible that a patient who presents with a URI on day one and a critical illness on day 3 may be "locked into" a level 2 or 3 physician service charge.

Emergency physicians need to be aware of governmental regulations that affect their practice and provide input to legislators to align regulations with reality.

Wound Management

a. Local Anesthetic Allergy

Many patients present to the ED with injuries that require infiltration of a local anesthetic and state that they are "allergic to lidocaine."

Esters such as procaine (Novocaine), tetracaine and benzocaine are most commonly implicated in allergic reactions. Allergic reactions to amides such as lidocaine, mepivacaine (Carbocaine) and bupivacaine (Marcaine) are exceedingly rare. Gall studied 177 patients who were referred with a history of allergic reactions to local anesthetics. All of the patients were challenged with lidocaine. Only one patient demonstrated an IgE response to the drug. Methylparaben, a preservative found in multiple doses vials, may also cause the allergic reaction. There is no cross reactivity between esters and amides.

If a patient gives an allergic history it should be determined if the reaction was a true allergy or just a vasovagal reaction. If the patient knows what agent caused the allergy, the other class of agents can be substituted safely.

Options to local anesthetics include:

- 1) Omit anesthetic for a small laceration
- 2) Apply ice over the wound

- 3) Inject NSS with 0.9% benzyl alcohol
- 4) Inject 1% Benadryl solution(50 mg - 1cc of Benadryl plus 4 cc NSS)
- 5) Use sedation (Nitrous Oxide, Fentanyl and Versed)
- 6) Use preservative free lidocaine (test dose of cardiac lidocaine 0.1 cc then wait 30 minutes before injecting the wound)

Gall H, et al: Adverse reactions to local anesthetics: Analysis of 197 cases. *J Allergy Clin Immunol* 97:933-37, 1996

Schatz M, Fung DL: Anaphylactic and anaphylactoid reactions due to anesthetic agents. *Clin Rev Allergy* 4:215-27, 1986

Swanson JG: Assessment of allergy to local anesthetic. *Ann Emerg Med* 12:316-8, 1983

b. Timing of Wound Closure

The “golden period” for wound closure is usually considered to be 6-12 hours. Older wounds are typically closed by means of a delayed primary closure or are left to heal by secondary intention. A Jamaican study of 372 patients found that 89 of 115 wounds closed more than 19 hours after injury healed successfully. Scalp wounds healed at a high rate (42 of 44) regardless of time from injury. These wounds were closed in a non-sterile setting using the same gloves for multiple patient encounters with “glove washing” between patients, dip sterilization of instruments and using non-sterile irrigants. This study suggests that primary closure can be used in wounds of any age that are not grossly infected.

Berk WA, Osbourne DD, Taylor DD. Evaluation of the golden period for wound repair: 204 cases from a Third World emergency department. *Ann Emerg Med* 1988;17:496-500

Berk WA, Welch RD, Bock BF. Controversial issues in clinical management of the simple wound. *Ann Emerg Med* 1992;21:72.

c. Epinephrine for Digital Blocks

Possibly no unsupported dogma is more quoted, and no attending more horrified than the one who finds a resident has used epinephrine-containing lidocaine for a digital block. There was practically no literature on the subject other than case reports, until a recently published study. In it a group of hand surgeons, desiring longer anesthetic effect for finger surgeries under local, used lidocaine with epinephrine for 106 digital blocks. They found a mean decrease in the digital-brachial index of 19%, all of which had returned to baseline by 60 minutes. There were no complications.

Sylaidis et. al. Digital blocks with adrenaline: An old dogma refuted. *J Hand Surg Br* 1998;23B:17

d. Irrigation of Wounds

Animal studies suggest that irrigation lowers the infection rate in contaminated wounds but there is no objective evidence that it is beneficial for "clean" lacerations. Hollander studied 1,923 patients with scalp and facial lacerations. Wounds in immunocompromised hosts, grossly contaminated lacerations and wounds greater than 6 hours old were excluded. The wound infection rate and cosmetic appearance was the same in the irrigated and non-irrigated groups.

Most traumatic wounds are cleansed with normal saline or sterile water. A British study (Riyat) investigated the bacterial cleanliness of tap water. Hot and cold taps as well as drinking faucets were analyzed for bacterial growth. No pathologic bacteria were isolated. An animal study of lacerations inoculated with Staph aureus (Moscoti) showed that irrigation with tap water from a faucet reduced bacterial contamination better than normal saline irrigation from a syringe.

Irrigation from a standard water faucet, which cheaply provides copious amounts of fluid at 45 psi may become the standard wound prep in the future.

Hollander JE, et al: Irrigation in facial and scalp lacerations: Does it alter outcome? *Ann Emerg Med* 31:73-7 1998

Moscoti RM, et al: Wound irrigation with tap water. *Acad Emerg Med* 5:1076-80, 1998

Riyat MS and DN Quinton: Tap water as a wound cleansing agent in accident and emergency. *Accid Emerg Med* 14:165-6, 1997

Arterial versus Venous Blood Gases

Many times an ABG is drawn only to look at the patient's acid-base status. In this situation, a venous gas gives the same information. There is a well established tight correlation between venous and arterial pH. This is true even in the presence of a serious acid-base disturbance such as DKA. In a study of 44 episodes of DKA in 38 patients, the mean difference between venous and arterial pH was 0.03, with the venous pH slightly lower. A similar correlation between venous and arterial HCO₃⁻ was found.

Assessment of carboxyhemoglobin levels is another frequently used indication for arterial blood gases. Venous carboxyhemoglobin in 61 paired samples varied by a mean of 0.15%. A significant limitation of this study is that the majority of patients had levels below 10%.

Brandenburg MA, Dire DJ. Comparison of arterial and venous blood gas values in the initial emergency department evaluation of patients with diabetic ketoacidosis. *Ann Emerg Med* 1998;31:459

Touger M, Gallagher EJ, Tyrell J. Relationship between venous and arterial carboxyhemoglobin levels in patients with suspected carbon monoxide poisoning. *Ann Emerg Med* 1995;25:481

Alcohol Metabolism

The metabolic rate of ethanol is of great interest to emergency physicians, not for its forensic & legal value, but for its importance in assessment and observation of intoxicated patients with potentially significant trauma or a depressed mental status. The often quoted rate of 20-30 in normal adults, with higher rates in alcoholics, has been clearly shown to be too high. A typical study in this field looked at 1090 double serum samples from DUI suspects. The mean metabolic rate in men was 18.9 +/- 0.48 mg/dl/hr, and 21.4 +/- 0.53mg/dl/hr in women, also disproving the assumption that men are better ethanol metabolizers than women.

A number of things have been suggested to increase the rate of ethanol clearance, but none is as effective as feeding the patient. In one 1994 study, food increased the clearance rate of ethanol by 30-50%.

Jones AW, et al. Food-induced lowering of blood-ethanol profiles and increased rate of elimination immediately after a meal. *J Forensic Sci* 1994;39:1084

Jones AW, Andersson L. Influence of age, gender, and blood-alcohol concentration on the disappearance rate of alcohol from blood in drinking drivers. *J Forensic Sci* 1996;41:922

C-Spine Immobilization for GSW to the Head

Physics would suggest that the kinetic energy of bullet transferred to an object with the mass of a human head cannot accelerate it sufficiently to stress the cervical spine. Routine C-spine immobilization for GSW to the head, followed by radiologic clearance of the neck is commonly practiced. In a recent study of 215 GSW to the head, no patient had a cervical injury. The authors suggest that routine immobilization is unnecessary unless the possibility of a cervical trajectory exists.

Kaups KL, et. al, Patients with gunshot wounds to the head do not require cervical spine immobilization and evaluation. *J Trauma* 1998;44:865.

Head CT Interpretation in Thrombolytic CT Interpretation

An ever increasing number of hospitals are providing thrombolytic therapy for stroke. Emergency physicians have been at the forefront in many centers in establishing effective, integrated stroke programs. Because of the very short time frame involved in a thrombolytic decision, an accurate reading of the CT for hemorrhage and signs of a large infarction is essential. Who provides this reading varies by institution and time of day. In this

study, which appears to have been humbling for all involved, EPs, neurologists, and general radiologist were asked to interpret scans with the assumption the patient had a stroke and was a potential thrombolytic candidate. The scans could have hemorrhage, infarction signs, calcifications or be normal. The overall correct interpretation rate was only 67% for EPs and 83% for neurologists and radiologist. Of the scans with hemorrhage, only 16% of the EPs, 38% of the neurologists, and 53% of the radiologists correctly identified all cases. This study should stimulate us to think very carefully about whose interpretation we rely on when making a high-stakes, time-critical decision on thrombolysis for stroke.

Schriger et. al, Cranial computed tomography interpretation in acute stroke: Physician accuracy in determining eligibility for thrombolytic therapy. *JAMA* 1998;279:1293

The Value of the Rectal Exam

The rectal exam for all abdominal pain patients may be the most ancient and venerated of all emergency medicine myths. Numerous articles have looked at the diagnostic value of the rectal exam for general abdominal pain and found that the rectal exam rarely added to the diagnosis. An example is the study by Dixon et al. of 1204 consecutive patients with right lower quadrant pain. Right sided rectal tenderness was present in 309 of the patients, representing an odds ratio of 1.34 for appendicitis, far less valuable than the findings of right lower quadrant tenderness (5.09), rebound tenderness (3.34), and muscular rigidity (5.03). In the logistic regression, when rebound tenderness was accounted for, the rectal exam added no information.

Bonello JC, Abrams JS. The significance of a "positive" rectal exam in acute appendicitis. *Dis Colon Rectum* 1979;22:97.

Scholer SJ, Pituch K, Orr DP, Dittus RS. Use of the rectal examination on children with acute abdominal pain. *Clin Pediatr* 1998;37:311-316

Dixon JM, Elton RA, Rainey JB, Macleod DA. Rectal examination in patients with pain in the right lower quadrant of the abdomen. *BMJ* 1991;302:386-388.

Ultrasound Examinations By Emergency Physicians

In the past there was a belief that ED ultrasound examinations could only be performed by an ultrasound technician and interpreted by a radiologist. This belief is still an impediment to the use of ultrasound by emergency physicians in many hospitals. The literature supports the concept that ED physicians can accurately perform limited goal-directed ultrasound studies after a minimal period of formal training.

Ultrasound exams in the emergency department setting are different than those that are performed in the radiology suite. They are highly focused

exams that attempt to address a specific clinical question. The ultrasound is done as an interactive process between the patient and physician and becomes an extension of the physical examination. It is brief and if necessary serial exams can be performed.

Ultrasound in the ED is primarily utilized to evaluate 6 conditions: traumatic hemoperitoneum, cardiac tamponade, ectopic pregnancy, abdominal aortic aneurysm, acute obstructive uropathy and cholelithiasis.

Recent studies have demonstrated the accuracy of ultrasound exams performed by emergency physicians with limited formal training. Schlager reported the experience of 14 physicians in a medium size community hospital. Limited ultrasound exams demonstrated the presence of gallstones, aortic aneurysms and intrauterine pregnancies with a high degree of accuracy. Plummer reviewed 10 years of penetrating cardiac injuries at a university trauma center. Use of ultrasound by emergency physicians to detect pericardial tamponade significantly decreased the time to diagnosis and improved outcomes in these patients. Ma reported results of abdominal ultrasounds on 245 trauma patients. ED physicians with limited training diagnosed hemoperitoneum with a sensitivity of 86% and specificity of 97%. These numbers are comparable to results obtained by radiologists. Matter prospectively studied endovaginal ultrasound exams performed by emergency physicians in 148 first trimester pregnancies. Videos of the sonograms were reviewed by a gynecologist. The gynecologist disagreed on the interpretation of 7 studies. In 5 of the 7 cases the EP's diagnosis was ultimately proven to be correct.

Burgher showed that bedside ultrasound by ED physicians utilized for patients with pelvic pain or vaginal bleeding decreased time spent in the ED by more than one hour compared to waiting for in-house consultants to perform the exam.

Burgher SW, et al: Transvaginal ultrasonography by emergency physicians decreases patient time in the ED. *Acad Emerg Med* 5:802-17, 1998

Heller M, Melanson SW: The use of ultrasound in the Emergency Department. *EM Clin NA*, 15:735-736, 1997

Ma OJ, et al: Prospective analysis of a rapid trauma ultrasound examination performed by emergency physicians. *J Trauma* 38:879-885, 1995

Mateer JR, et al: Ultrasonographic examination by emergency physicians of patients at risk for ectopic pregnancy. *Acad Emerg Med* 2:867-873, 1995.

Melanson SW and M Heller: The emerging role of bedside ultrasonography in trauma care. *Emerg Med Clin NA* 16:165-89, 1998

Plummer D, et al: Emergency department echocardiography improves outcome in penetrating cardiac injury. *Ann EM* 21:709-712, 1992

Schlager D, et al: A prospective study of ultrasonography in the ED by emergency physicians. *Am J of EM*, 12:185-189,1994

Utility of Orthostatic Vital Signs

Orthostatic vital signs are routinely obtained in many emergency departments in patients who are suspected of being hypovolemic from blood loss or dehydration. The large variability in orthostatic vital signs between individuals however, limits their usefulness as a screening test.

Bergman studied 455 pediatric patients who were presumed to be euvoletic. 25% exhibited changes in heart rate and 10% showed changes in blood pressure with postural testing. A positive test was found to be independent of a final diagnosis. A study in 132 euvoletic adults (Koziol-McLain) demonstrated a huge range of changes in heart rate and blood pressure with orthostatic testing making the utility of a positive "tilt test" suspect. A study measuring capillary refill times in 47 phlebotomized patients (Schriger) demonstrated a decrease in capillary refill time after phlebotomy.

Orthostatic vital signs and capillary refill times are purported to be useful clinical tools for assessing hypovolemia. Many physicians seem to feel that it can't hurt to get them. But what are the costs? Valuable nursing time may be wasted performing orthostatic vital signs. The golden rule of testing is "Does the test change your management"? If abnormal orthostatic vital signs result in the ordering of unnecessary IV's or laboratory tests then their cost is substantial.

Bergman GE, et al: Orthostatic changes in normovolemic children: an analysis of the "tilt test". *J Emerg Med* 1:137-141, 1983

Koziol-McLain J, et al: Orthostatic vital signs in emergency department patients. *Ann EM*, 20: 606-610, 1991

McGee S, et al: Is this patient hypovolemic. *JAMA* 281:1022-9, 1999

Schriger DL, Baraff LJ: Capillary refill--is it a useful predictor of hypovolemic states? *Ann EM*, 20:601-605, 1991