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## Don't let ED overcrowding put AMI, pneumonia patients at risk

*Emergency nurses 'can provide better care'*

*(Editor's note: This is a special issue covering delays in clinical care as a result of ED overcrowding. This month, we cover pneumonia and acute myocardial infarction patients that aren't receiving timely interventions, a rapid triage system that ensures patients aren't harmed due to crowded waiting rooms, and ways to ensure that patients in severe pain don't wait for relief.)*

**W**ould you be shocked to learn that a large number of patients with acute myocardial infarction (AMI) and pneumonia are dying because certain interventions aren't done in the ED? That's what a new study suggests, with researchers estimating that poor care in EDs causes 22,000 needless deaths each year.<sup>1</sup>

Of 1,492 heart attack patients at 544 EDs from 1998 to 2004, only 40% received aspirin therapy and 17% received beta-blockers. Of 3,955 pneumonia patients, 69% received antibiotics as recommended, and 46% had blood oxygen levels assessed. All of these interventions are required by The Joint Commission and the Centers for Medicare & Medicaid Services.

"The system, which ED nurses and physicians are working within, can provide better care for our heart attack and pneumonia patients," says **Julius Pham, MD**, the study's principal investigator and assistant professor of medicine in the Johns Hopkins Department of Emergency Medicine in Baltimore.

ED nurses should act as a "check and balance" to physicians to be sure patients

### EXECUTIVE SUMMARY

Patients with pneumonia and acute myocardial infarction (AMI) are dying needlessly because interventions aren't being done in the ED, says one study. Another study links long wait times to adverse events in AMI patients and poor compliance with guidelines. To improve care when your ED is overcrowded:

- Anticipate the need for intravenous access, labs, chest X-rays, and blood cultures.
- Ask the physician if your patient will need antibiotics.
- Order labs and diagnostic tests at triage.

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receive the most appropriate treatment, says Pham. “Nurses can take the lead in developing protocols where every patient with a heart attack will receive aspirin and beta blockers, unless contraindicated,” he says. Likewise, protocols should be used to ensure that pneumonia patients receive oxygen assessment and antibiotics, adds Pham.

At the University of California — Los Angeles (UCLA) Medical Center, ED nurses use protocols for AMI and pneumonia patients that require specific medications and interventions, says **Johanna Bruner, MS, RN, FNP**, director of the Emergency Medicine Center. “We constantly review the protocols for compliance with core measures guidelines and post results for all to review.”

Another study found that prolonged ED stays for patients with non-ST segment elevation MI are linked to increased adverse events and worse adherence to

American College of Cardiology/American Heart Association guidelines.<sup>2</sup> Researchers looked at 42,780 patients and found that patients with long stays received recommended therapies less often.

The key issue for ED nurses is to facilitate the transition to inpatient orders as soon as possible, says **Deborah B. Diercks, MD**, the study’s lead author and assistant professor in the Department of Emergency Medicine at University of California — Davis Medical Center in Sacramento. “Since the ED has little control over when admitted patients receive an inpatient bed, we need to be sure to initiate appropriate therapy in the emergency department,” she says.

### **Fewer antibiotics given**

When ED waiting rooms are crowded, pneumonia patients wait longer for antibiotics, sometimes to the point where they do not receive them at all, according to two new studies.<sup>3,4</sup>

**Christopher Fee, MD**, lead author of one of the studies and assistant clinical professor in the Division of Emergency Medicine at University of California, San Francisco, says, “I think the time to antibiotics is a good surrogate marker for quality of care, since other processes of care are likely to be affected in a similar manner when the ED becomes crowded.”

The researchers expected to find that time-to-antibiotics was delayed at a certain threshold, which would indicate that staff had become overwhelmed, says Fee. “What surprised us was that we were unable to find convincing evidence that any such threshold existed,” he says. “It actually looks just as plausible that even at low ED patient volumes, the addition of one more patient led to a delay in antibiotic administration.”

The take-home message for ED nurses: Don’t be complacent even if the ED is relatively empty, says Fee. “It is apparent that even during those times, each additional patient leads to delays in antibiotic administration for pneumonia patients and is likely to cause similar delays for other interventions in other patients,” he says.

The study shows that EDs have very little “buffer zone” to accommodate additional patients, says Fee. “Nurses can help by anticipating the need for [intravenous] access, labs, chest X-rays, and blood cultures,” he says. “Protocols should be used to expedite these steps.”

Don’t hesitate to ask ED physicians if a patient is going to need antibiotics, says Fee. “This may serve as a reminder to a busy physician to check on lab results and X-rays, and stimulate them to write the order that they haven’t yet done,” he says.

*Continued on page 28)*

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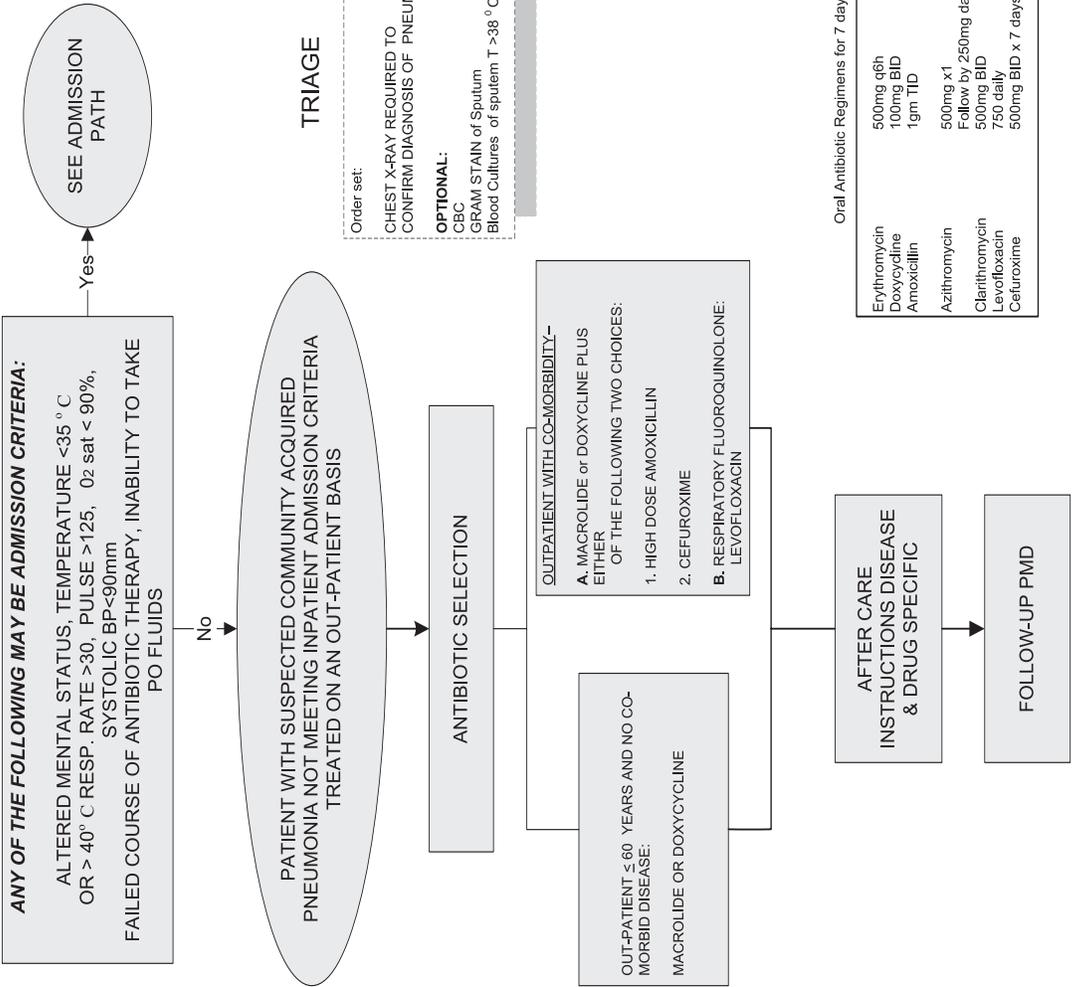


# UCI Medical Center Antibiotic Therapy for Out-Patient Treatment for Community Acquired Pneumonia

**GOAL: MUST RECEIVE ANTIBIOTICS PRIOR TO DISCHARGE**

Patient Characteristic	Points
<b>Demographic Factors</b>	
Male age in years	Age
Female age in years minus 10	Age -10
Nursing home resident	10
<b>Comorbidities</b>	
Neoplastic disease	30
Liver disease	20
Congestive heart failure	10
Cerebrovascular disease	10
Renal disease	10
<b>Physical examination findings</b>	
Altered mental status	20
Respiratory rate $\geq$ 30/min	20
Systolic BP < 90 mmHg	20
Temperature < 35 °C or $\geq$ 40 °C	15
Pulse $\geq$ 125/min	10
<b>Laboratory Findings</b>	
PH < 7.35	30
BUN $\geq$ 29.7 mg/dl	20
Sodium < 130 mEq/L	20
Glucose > 250 mg/dl	10
Hematocrit < 30 %	10
PO <sub>2</sub> < 60 mm Hg *	10
Pleural effusion	10
<b>Total</b>	

Stratification of Risk Score	
Classes based on age, comorbidities and clinical findings. Risk classes I to II are considered low risk. Risk classes IV and V are moderate to high risk	
<b>CLASS I</b>	<b>Low Risk</b>
< 50 years of age	
No comorbidities (see below)	
No abnormal physical examination findings (see below)	
<b>CLASS II to V Recommendations for Care</b>	<b>Out Patient</b>
<b>Class II</b> $\leq$ 70 points	<b>Low Risk</b>
<b>Class III</b> 71-90 points	<b>Low Risk</b>
<b>Class IV</b> 91-130 points	<b>Moderate</b>
<b>Class V</b> >130 points	<b>High</b>



### TRIAGE

Order set:  
CHEST X-RAY REQUIRED TO CONFIRM DIAGNOSIS OF PNEUMONIA  
**OPTIONAL:**  
CBC  
GRAM STAIN of Sputum  
Blood Cultures of sputum T >38 °C

Oral Antibiotic Regimens for 7 days

Erythromycin	500mg q6h	\$5.00
Doxycycline	100mg BID	\$1.00
Amoxicillin	1gm TID	\$1.00
Azithromycin	500mg x1	\$4.00
Clarithromycin	Follow by 250mg daily x 4 days	\$13.00
Levofloxacin	500mg BID	\$44.00
Cefuroxime	750 daily	\$44.00
	500mg BID x 7 days	\$10.00

\*Oxygen saturation <90% is also considered abnormal.  
eg. 50-yr old female with neoplastic disease and respiratory rate  $\geq$ 30.min=50 -10+30+20=90

Risk classification was partially adapted from the Infectious Disease Society of America and the American Thoracic Society,(Fine et al 1997)  
EACH PATIENT IS AN INDIVIDUAL AND THE RESPONSES MAY VARY. THIS CLINICAL PATH IS TO BE USED AS A GUIDELINE ONLY.

ED nurses at University of California Irvine Medical Center follow a protocol for community-acquired pneumonia based on guidelines from the Infectious Diseases Society of America and the American Thoracic Society. (See ED protocol on p. 27. To access the guidelines, see resource box, right.)

The algorithm addresses care and antibiotic selection for patients treated and discharged from the ED, as well as patients admitted from the ED to the medical floor or intensive care unit, says **Tania V. Bridgeman**, PhD, RN, director of clinical path development for the Department of Emergency Medicine.

“The algorithm is accessible on the ED computer greaseboard and is printed off and placed on the patient’s chart,” she says. Here are steps taken by ED nurses:

— At triage, nurses initiate orders including chest X-ray, gram stain of sputum, blood cultures for temperature greater than 38° C, and a complete blood count.

— Antibiotics are administered prior to discharge from the ED.

— If the patient meets inpatient criteria, antibiotics are to be administered within six hours of presentation, with the first dose given in the ED.

— A risk score is determined, with abnormal lab findings given a numeric value, such as a score of 10 for pleural effusion. “This helps nurses to decide the level of care necessary,” says Bridgeman.

Because the ED nurse can order labs and diagnostic tests at triage, a faster diagnosis is possible, she says. The algorithm reduces the chance of inappropriate administration of an antibiotic and reduces the time to drug administration, Bridgeman says. “The ED nurse basically drives the utilization of the algorithm, which serves as an evidence-based guideline to all staff and residents,” she says.

The protocol reminds nurses to give antibiotics within a six-hour time frame, which is difficult with a full ED and a pending diagnosis, says Bridgeman. “ED nurses are continuously reminded of the time constraints and do their best to meet the six-hour-or-less timeframe,” she says. “To date, there has *not* been inappropriate administration of an antibiotic.”

At UCLA Medical Center, antibiotics are given based on the patient’s presentation and symptoms if pneumonia is diagnosed on a chest X-ray, says Bruner. “We will do blood tests as well, but we want to get those medications in under a four-hour time period, and we will expedite care to do this for the sake of the patient,” she says.

The ED’s performance improvement committee, comprised of nurses and a physician, reviews results of audited charts for core measure compliance and identifies areas in need of improvement, adds Bruner. “Then we educate to ensure compliance and good patient care,” she says.

## References

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## SOURCES/RESOURCE

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A PDF file of the 2007 *Infection Disease Society of America/American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults* can be accessed at no charge at the American Thoracic Society’s web site ([www.thoracic.org](http://www.thoracic.org)). Under “Education,” click on “ATS Documents: Statements, Guidelines & Reports,” and then “IDSA/ATS Community Acquired Pneumonia Guidelines.”

3. Fee C, Weber EJ, Maak CA, et al. Effect of emergency department crowding on time to antibiotics in patients admitted with community-acquired pneumonia. *Ann Emerg Med* 2007; 50:501-509.
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## ED nurses revamp triage because of overcrowding

*System addresses need for early intervention*

At Johns Hopkins Hospital in Baltimore, MD, ED nurses revamped their triage process due to crowded waiting rooms causing delays in clinical interventions, says **Kathy DeRuggiero**, RN, MSN, assistant director of nursing for the Department of Emergency Medicine.

“We have made changes to get to the bad news faster,” she says. “We have an ED built for 150 patients on average; but some days, we see over 200. We had a capacity issue on the back end.”

This meant that patients in need of early intervention were waiting too long for chest X-rays and electrocardiograms (ECGs), says DeRuggiero. A new “rapid triage” system was created to sort patients in a different way and “move the diagnostics up front to the waiting room” for these patients, she says.

Two nurses now handle triage, with the first nurse finding out the chief complaint of every patient in less than 60 seconds, DeRuggiero says. “If the patient is in jeopardy of losing life or limb, they go right back,” she explains. “We can’t wait for patients to get back to beds anymore. All the studies show that the earlier these interventions are done, the better the outcomes.”

For example, in order to give a pneumonia patient antibiotics within the first four hours of arrival, a chest X-ray needs to be done in the waiting room, as opposed to waiting until the patient is brought back to a treatment room, she says.

With the previous triage system, the nurse obtained vital signs and history for each patient, and this took too much time, says DeRuggiero. “That alone takes 10 minutes per patient. If you are four patients deep and one is having an AMI [acute myocardial infarction], there is no way to get to them in a timely fashion,” she says.

### ***What could you have done better?***

Every pneumonia and AMI case is reviewed by DeRuggiero and the ED clinical director to see what could have been done better at triage. Recently, they identified that patients who are possible candidates for

## SOURCES

For more information on the ED’s rapid triage system, contact:

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percutaneous coronary intervention (PCI) would benefit from the cardiac catheterization team being called before the patient even arrives at the ED.

“The medics actually call in the ECG reads, and the team is activated based on the reading so we can get them moving,” she says. “If you’ve only got 90 minutes to get them from the door to the balloon, you don’t have 45 minutes to wait for the cath team to get there during off hours.”

Much of the time, the team is canceled because the patient turns out not to be a candidate for PCI, DeRuggiero adds. “But we are willing to do that to find that needle in the haystack,” she says. “There are a certain amount of patients that you will respond to who don’t meet the criteria, in order to find that one who does.”

Nurses are given feedback about the good outcomes of patients who otherwise would have been sitting in the waiting room and possibly would have died, says DeRuggiero. “Because of this early recognition process, we have saved lives of pneumonia, AMI, and stroke patients,” she says. ■

## Crowded ED equals worse management of pain

*Packed waiting rooms mean that patients suffer*

When ED waiting rooms are overcrowded, patients with severe pain are more likely to get poor quality care, according to a recent study. Researchers found that only about half (49%) of 13,758 patients with severe pain received pain medication. Of those, 59% had more than an hour delay in treatment from triage, and 20% had more than an hour delay in treatment after being placed in a room.<sup>1</sup>

“It is vital for emergency nurses to understand the impact that a crowded ED has on quality of care,” says **Jesse M. Pines**, MD, MBA, MSCE, the study’s lead

## SOURCE

For more information about pain management and overcrowding, contact:

- **Jesse M. Pines**, MD, MBA, MSCE, Assistant Professor of Emergency Medicine, University of Pennsylvania School of Medicine, Philadelphia. Phone: (215) 662-4050. E-mail: Jesse.Pines@uphs.upenn.edu.

author and assistant professor of emergency medicine at the University of Pennsylvania School of Medicine in Philadelphia. “The first step is for nurses to recognize that this is an issue: that their patients suffer when the ED is crowded.”

While this may come as no surprise to nurses who work in busy EDs, recognition that quality of care suffers when the ED is crowded is important to quality improvement, Pines emphasizes. “This is as much a message for ED staff as it is for government and quality organizations who should implement public policy to make hospitals fix ED crowding,” he says.

### Reference

1. Pines JM, Hollander JE. Emergency department crowding is associated with poor care for patients with severe pain. *Ann Emerg Med* 3 October 2007. DOI: 10.1016/j.annemergmed.2007.07.008. ■



## Don't assume that febrile illnesses aren't serious

*Effects might last more than a week*

Children with febrile illnesses might have more serious outcomes than you expect, according to new research on 322 children presenting with fever who were discharged from a pediatric ED. The researchers contacted caregivers by telephone seven to 10 days after the ED visit and learned that 38.9% of children remained febrile for five days or longer, and impairments in activity, oral intake, sleep, and behavior persisted longer than 2.5 days.<sup>1</sup>

“Most emergency department staff, not just nurses, often refer to febrile illnesses as ‘mild’ or ‘minor,’” says **Rakesh D. Mistry**, MD, MS, the study’s author and ED physician at Children’s Hospital of Philadelphia. “Many of these children tend to be triaged as nonurgent and just shuttled in and out of EDs as rapidly as possible.”

However, the study shows that there are often substantial effects of fever and febrile illnesses for more than a week, says Mistry. “In most cases there is little that we can do to change these outcomes,” he says. “But I think it is important for nurses and physicians to realize that febrile illnesses may not be as benign as previously believed.”

When children with fever are discharged from the ED, there is a tendency to assume that the illnesses resolve without consequence, but 23.7% children in the study had repeat visits for their illness, says Mistry. “Think about that for a minute: Nearly one in 4 children had a nonscheduled return visit,” he says. “We must realize that the ED is one aspect of the continuum of care, and these illnesses need ongoing care in many instances.”

When discharging children with febrile illnesses, explain to parents that many children are affected for more than four days, either with fever or other functional impairments, advises Mistry.

“If parents are aware of this potential, it could possibly decrease their stress level over their child’s illness, and even decrease health care revisitation,” he says. “Anticipatory guidance is essential to emergency medicine practice, and we must properly inform parents what to expect.” Febrile children should not be discharged if they are ill or toxic-appearing, are immunosuppressed, or have a presumed life-threatening infection, adds Mistry.

Also emphasize the importance of antipyretics in the home care of these children, says Mistry. “We found that despite the fact that children experienced prolonged fever, longer than five or even seven days, parents were rarely administering adequate dose

## EXECUTIVE SUMMARY

Children often have lingering effects from febrile illnesses, with fever lasting for five days or more in 38.9% of children coming to the ED with fever, says a new study.

- Nearly one in four children had a nonscheduled return visit.
- Inform parents that fever and functional impairments might last more than four days.
- Instruct parents to give adequate doses of antipyretics.

## SOURCES

For more information about febrile illnesses in pediatric patients, contact:

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- **Sarah Riley**, RN, MSN, Nurse Manager, Emergency Department, Cook Children's Medical Center, Fort Worth, TX. Phone: (682) 885-4901. E-mail: sarahri@cookchildrens.org.

frequency of acetaminophen or ibuprofen," he says.

Adequate antipyresis could reduce febrile periods and functional impairment, explains Mistry. "This could in turn reduce revisits to health care, since these outcomes often are the impetus for caregivers to seek health care again," he says.

### Do these interventions

Look for these signs that a child's febrile illness may be becoming life-threatening: Lethargy and/or altered mental status; prolonged seizures with hypoxia or any oxygen compromise including apnea, mottling, or pallor; petechial rashes; and tachycardia with hypotension, says **Sarah Riley**, RN, MSN, nurse manager of the ED at Cook Children's Medical Center in Fort Worth, TX. (See related story, right, for questions you should ask at triage.)

Consider the child's age, as a 2-year old with a fever of 101° F is much different than a 3-week old with the same temperature, she says. "With the febrile neonate, a much more extensive work-up and much more severe illness can be anticipated than the toddler," says Riley. Also take into consideration if the fever is subjective or objective, says Riley. "Many families come to the ED with complaints of fever, but the temperature has never been taken," she adds.

Key indicators include skin color, temperature, level of consciousness, and oxygenation, says Riley. "Any deviations in these are a red flag for the ED nurse that the patient's condition is deteriorating and causes should be quickly identified and treated," she says.

For example, if a child presents with a history of headache and fever for the past two days, the eruption of a petechial rash with these associated symptoms should alert you that meningitis is a possible diagnosis, says Riley. "With the rash, a later symptom, the ED nurse would then take a different care path than from the patient with just a fever, thus anticipating a rapid deterioration."

## Reference

1. Mistry RD, Stevens MW, Gorelick MH. Short-term outcomes of pediatric emergency department febrile illnesses. *Ped Emerg Care* 2007; 23:617-623. ■

## Ask these questions for children with fever

If a child presents with fever or chief complaint of fever, always ask these questions, says **Michelle Schnedler**, RN, associate nurse manager for the Emergency Center at William Beaumont Hospital in Royal Oak, MI:

- When did the fever start?
- Is your child acting differently or not as active as normal?
  - Did you give the child any medications for the fever? If so, what time? "This is important, to avoid overdosing in the ED," says Schnedler.
  - Is the child experiencing any vomiting, diarrhea, and/or poor appetite?
  - When is the last time your child urinated, and how many times today?
  - Has your child been exposed to any illnesses or infections?
  - Is anyone else in the home sick?

Signs that a child's condition is serious or potentially life-threatening include listlessness, decrease in mental status, respiratory distress, poor perfusion, bulging or sunken fontanel under six months in age, development of a rash, poor feeding, and constant vomiting and diarrhea, says Schnedler.

**Kimerlie Stover**, RN, BSN, CPN, manager of the ED and observation unit at Children's Hospital of Michigan in Detroit, says, "You want to know the child's hydration

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status, to be sure they are drinking and keeping fluids down.” Offer popsicles, Stover says. “These are a good source of fluid, plus the coolness will help with the fever.”

Signs of dehydration include decreased urine output, dark circles around eyes, sunken fontanel in infants, and “generally looking like a limp dish rag,” says Stover.

Ask if their immunizations are up to date as well, says Stover. “Immunization status is always important when looking at children,” she says. “HIB immunizes against some meningitis bugs. Pertussis could be an issue for those not immunized.”

Also ask whether activity level has changed with the fever, advises Stover. “Low activity level could warrant further investigation to make sure nothing more serious is going on, like a bacterial infection that would need antibiotic therapy,” she says. ■

## Pregnant patient at risk for unnecessary appendectomy

Pregnant women who come to the ED with abdominal pain often are misdiagnosed and undergo unnecessary appendectomies, says a new study.<sup>1</sup>

Researchers looked at 94,789 women who underwent open or laparoscopic appendectomy, and 3,133 of them were pregnant. The rate of negative appendectomy was significantly higher in pregnant women (23% vs. 18%) than in nonpregnant women.

“I think the most important message for ED nurses is that abdominal pain in the pregnant patient can be difficult to diagnose and may include both surgical and nonsurgical causes,” says **Marcia McGory**, MD, the study’s author and research fellow at the Center for Surgical Outcomes and Quality at the University of California — Los Angeles Medical Center

Although negative appendectomy in other patient populations generally does not have any unforeseen consequences, unnecessary surgery should be minimized in the pregnant patient due to risk to the fetus, she explains. The study’s results suggest that improved diagnostic accuracy of appendicitis in pregnant women may minimize risk of fetal loss or early delivery, says McGory. “ED nurses can assist with patient advocacy by encouraging pregnant women to pursue additional imaging prior to making the decision to undergo surgery to remove the appendix,” she says.

At Virginia Commonwealth University Medical Center in Richmond, ED nurses ask patients the following questions at triage for pregnant patients with abdominal pain, says **Steve Rasmussen**, RN, CEN,

clinical coordinator for the ED:

- How many weeks pregnant are you? “Under 20 weeks the fetus is considered nonviable and is seen in the ED, although even this is being reconsidered in light of recent premature saves,” he says. “Over 20 weeks and the patient is sent to OB for evaluation.”

- How many pregnancies have you had and how many live births?

- Have you had prenatal care?

- Do you have a history of multiple pregnancies or multiple births?

- Have you had problems with other pregnancies, or how is this pregnancy different?

- Do you use drugs or alcohol?

- Have you had a recent urinary tract infection, sexually transmitted disease, or vaginal discharge?

- Is there a history of HIV, hepatitis, tuberculosis, MRSA, diabetes, congestive heart failure, or pre-eclampsia?

- Are you bleeding? If so, how much?

- Is the bleeding painful? Placental abruption can cause severe hemorrhage and is a significant cause of maternal and fetal mortality, says Rasmussen. “Abdominal pain, uterine tenderness, tetanic uterine contractions, hypertension, and pre-eclampsia are associated with increased rates of occurrence,” he says. Painless bleeding can indicate placenta previa, which means the placenta is implanted abnormally, he adds. “It is most common in the third trimester and may require a caesarean section to stop the bleeding and save the mother’s life,” he says.

- Did bleeding or pain occur spontaneously or after sex or some type of trauma?

- Is there a possibility of domestic violence?

- Is there a psychological history, with or without drug therapy? “Remember when assessing fetal heart tones with an audible Doppler, palpate the mother’s pulse and make sure you are not listening to the mother’s heart rate,” says Rasmussen.

### EXECUTIVE SUMMARY

Pregnant patients who come to EDs with abdominal pain are at higher risk for unnecessary appendectomies than other patients, says a new study.

- Due to risk of fetal loss, encourage women to obtain additional diagnostic testing.

- Suspect placental abruption or placenta previa with bleeding.

- Palpate the mother’s pulse to be sure you are listening to fetal heart tones.

## SOURCES

For more information on assessment of abdominal pain in pregnant patients, contact:

- **Marcia L. McGory**, MD, Research Fellow, Center for Surgical Outcomes and Quality, University of California — Los Angeles Medical Center, Los Angeles, CA. E-mail: mmcgory@mednet.ucla.edu.
- **Steve Rasmussen**, RN, CEN, Clinical Coordinator, Emergency Department, Virginia Commonwealth University Medical Center, Richmond, VA. Phone: (804) 828-7330. E-mail: srasmussen@mcvh-vcu.edu.

## Reference

1. McGory ML, Zingmond D, Tillou A, et al. Negative appendectomy in pregnant women is associated with a substantial risk of fetal loss. *J Am Coll Surg* 2007; 205:534-540. ■

# Choose best way to rapidly fluid resuscitate children

*Guidelines can be met in two ways*

If a child is in septic shock, there is no question that they require rapid fluid resuscitation, with 20mL/kg of bolus intravenous (IV) fluid given within five minutes, according to guidelines from the American College of Critical Care Medicine (ACCM).<sup>1</sup> But what is the best method to do this?

Of three commonly used, inexpensive methods of fluid delivery, researchers at Nationwide Children's Hospital in Columbus, OH, expected that only use of a manual push-pull system would allow for compliance with the guidelines.<sup>2</sup> However, the researchers found that the use of a pressure bag and a manual push-pull system both appear to be acceptable methods of rapid fluid delivery.

"There was a lot of dispute out there as to whether the guidelines could be met, but in fact, we showed they can," says **Michael J. Stoner**, MD, one of the study's authors and a pediatric ED physician at Nationwide Children's.

There is frequent noncompliance with the guidelines, due to a misconception that that the administration of 20 mL/kg to a child within five minutes is technically unfeasible because of the patient's size and the small

caliber of IV catheters used in children, he explains.

For 57 children, researchers rapidly gave IV fluid up to 20 mL/kg or five minutes, whichever came first, by a pressure bag maintained at 300 mmHg, by a manual push-pull system or by gravity. The ACCM guideline was met in 58% of the pressure bag group, 68% of the push-pull group, and none of the gravity group. No children weighing greater than 40 kg met the guideline in any of the groups.

"Even though the study shows that appropriate ways of delivering fluid to a shocky child include either a syringe or a pressure bag, it's really difficult to quantify fluid with a pressure bag," notes Stoner. "I personally think that using a syringe is the best way to account for the fluid. The biggest consideration is it takes a second person, which might be difficult if you are short staffed."

A regular standard pump is inadequate, says Stoner. "You might be tempted to put the child on a pump because you want to account for every drop, but the pump doesn't cut it," he says. It would take too long to fluid resuscitate any child in septic shock weighing over four kilograms, he explains. "If your patient is in respiratory distress, taking a half-hour to give them oxygen would not be appropriate," he says. "Taking that long to get somebody in septic shock enough fluid also isn't appropriate. Standard pumps just aren't quick enough."

Rapid fluid delivery isn't appropriate for every dehydrated pediatric patient, cautions Stoner. "This is just to remind people of another option for the child who is really sick and shocky, who needs to get fluid resuscitated quickly," he says.

Also, if you are using pressure bags, there is a risk of giving too much fluid to a pediatric patient, says Stoner. "If you are in an adult mindset and giving boluses by the liter, the pressure bag is great," he says. "But a lot of times that is too much fluid for a child, and smaller volumes are difficult to judge with the pressure bag."

## EXECUTIVE SUMMARY

Use of a pressure bag and a manual push-pull system are both acceptable methods of rapid fluid delivery for children in septic shock, says a new study.

- Children must be given 20mL/kg of bolus intravenous fluid within five minutes.
- A regular standard pump is inadequate because it takes too long to fluid resuscitate a child.
- With pressure bags, there is a risk of giving too much fluid to a pediatric patient.

## SOURCES

For more information on caring for pediatric septic shock patients, contact:

- **Michelle Clark**, RN, Assistant Manager of Nursing, Emergency Department, Children's Healthcare of Atlanta, Atlanta. Phone: (404) 785-6788. E-mail: michelle.clark@choa.org.
- **Michael J. Stoner**, MD, Emergency Department, Nationwide Children's Hospital, Columbus, OH. Phone: (614) 722-4385. Fax: (614) 722-4380. E-mail: michael.stoner@nationwidechildrens.org.

### Know early signs of septic shock

If there is *any* indication to think “this might be shock,” act on your instincts and put a plan in motion, advises **Michelle Clark**, RN, assistant manager of nursing for the ED at Children's Healthcare of Atlanta.

Children have an excellent compensatory mechanism to keep themselves hemodynamically stable and keep their vital organs oxygenated and perfused, explains Clark. “They increase their heart and respiratory rates,” she says. “Their arteries dilate, but the venules remain constricted, and they may have a normal blood pressure early in sepsis.”

While their blood pressure may look normal, look for widening pulse pressures, says Clark. “The heart is continually pumping faster than normal, but eventually the cardiac output will decrease,” she says.

Septic children usually present with fever, although neonates may be hypothermic, notes Clark. “Sometimes this phase is missed until the patient becomes unstable and is noticed in retrospect,” she says. If you fail to recognize the subtle clues in the beginning stages, the child may advance to decompensated shock, warns Clark. **(See related story, right, for steps to take for pediatric shock patients.)**

Signs and symptoms of cold shock include a change in mental status with much decreased responsiveness, decreased urine output, edema, metabolic acidosis, hypotension, poor perfusion with decreased peripheral pulses, hypoglycemia, and eventually disseminated intravascular coagulopathy, says Clark. “Irreversible shock occurs when damage to vital organs cannot be reversed,” she says. “These children may be initially resuscitated, but die secondary to multisystem organ failure.”

Early treatment for septic shock includes volume expanders, antibiotics to fight the underlying infection, increased oxygen delivery, and decreased oxygen

demand by reducing fevers and keeping the child calm, says Clark.

Although it doesn't occur in every case, some children get more hemodynamically unstable after their first dose of antibiotics, notes Clark. “This may be associated with the introduction of antibiotics which release endotoxins from the bacteria, or the child may just be getting worse,” she says. “Again, this is treated with volume expanders and sometimes an additional antibiotic.”

### References

1. Carcillo JA, Fields AI. Clinical practice parameters for hemodynamic support of pediatric and neonatal patients in septic shock. *Crit Care Med* 2002; 30:1,365-1,378.
2. Stoner MJ, Goodman DG, Cohen DM, et al. Rapid fluid resuscitation in pediatrics: Testing the American College of Critical Care Medicine Guideline. *Ann Emerg Med* 2007; 50:601-607. ■

## What to do when you suspect septic shock

**W**hen faced with a septic pediatric patient, what you do can affect whether this seriously ill child survives.

“The child's ongoing care is always determined with respect to the child's response to the initial resuscitation measures,” says **Dana Jundt**, MSN, C-PNP, an ED nurse practitioner at Children's Hospital of Orange County (CA).

“It is literally a minute-by-minute assessment, reassessment, and management adjustment,” says Jundt. “If serious problems are not addressed immediately, it may adversely affect the overall success of any resuscitation.”

For example, a child who is hypoglycemic but not given a glucose solution is at risk for seizure, and child who is hypothermic may progress from compensated shock to decompensated shock if thermoregulation is not addressed, says Jundt.

“A child whose blood pressure is abnormally low and not given proper fluid resuscitation will continue a downward spiral to cardiovascular collapse,” she says. “A child who has a critically low blood pressure and who is in hypovolemic shock may need pressors initiated.”

The rate of survival for a child suffering a respiratory arrest is 40% and the rate of survival for a child suffering a cardiac arrest is less than 1%, adds Jundt. “It is so important to initiate proper resuscitative measures in children before they suffer either a respiratory or cardiac arrest,” she says. Here are tips to improve

care of pediatric septic shock patients:

- **Control and maintain airway and breathing, and identify circulatory deficits.**

This step should be your first priority, says **Linda Pierog, FNP**, an ED nurse practitioner at Children's. "Hypotension is a late sign. Skin signs are apparent earlier," she says. Remember that core temperature regulation is more difficult in infants due to larger surface area, small glycogen stores, and thin skin, she says. "Larger surface areas make them susceptible to dehydration," says Pierog.

- **Understand the stages of septic shock.**

Your plan of care must consider "where the patient is" in the continuum of the evolving shock state, says Jundt. During the hyperdynamic phase capillary refill is near normal, and peripheral pulses are easily palpated, although bounding with moderate tachycardia, she adds.

The hypodynamic phase is similar to uncompensated and irreversible shock, with altered mentation, lethargy, pale mottled skin, and weak thready pulse, she says. "The vascular volume is misplaced in septic shock, and a widespread response is initiated in response to the infecting organism," says Jundt.

- **Assist with fluid resuscitation.**

Fluid resuscitation is always done with normal saline or lactated ringers, with boluses calculated based on the child's weight, says Jundt. "Each fluid bolus is 20 cc/kg and can be repeated three times for most children," she says. "Children with underlying cardiac or renal disease may deserve special attention or less volume depending on the circumstances."

Obtain immediate intravenous access, using a 22 gauge or larger, using the intraosseous route if the percutaneous route is unsuccessful, says Jundt. "Calculating fluid volumes are the same whether they are given intraosseous or peripherally," she says.

Jundt advises you to have the following equipment available: oxygen, normal saline, intravenous pumps and catheters, bedside glucose monitoring system, dextrose solution to give if the child is hypoglycemic, cardiopulmonary/respiratory monitor, pulse oximetry, and a radiant warmer.

Correct pre-existing or present intravascular volume through rate of administration and amount of fluid infused, says Jundt. "Use warmed fluids any time a child's temperature is critically low," she says. "Newborns and infants with normal temperatures can be

## SOURCE

For more information on interventions for pediatric septic shock, contact:

- **Dana Jundt, MSN, C-PNP**, Children's Hospital of Orange County, Orange, CA. Phone: (714) 771-8000, ext. 18113. Fax: (714) 744-8527. E-mail: danajundt@gmail.com.

cold stressed easily when given IV fluids which have been stored at room temperature."

Accurately record fluids administered and communicated to all patient care team members, says Jundt. Document time of insertion; device used; number of attempts; site of insertion; type of fluid started and rate; vital signs before and after each fluid bolus, or more frequently as indicated; and urine output, she advises.

- **Monitor the patient's response.**

Quick and accurate communication about the child's respiratory status, vital signs, urine output, level of consciousness, and response to each fluid bolus is critically important, says **Nicole Herriott**, also an ED nurse practitioner at Children's. "It is this key responsibility of the emergency nurse that facilitates a successful outcome," she says. ■

## CNE instructions

Nurses participate in this continuing education program by reading the issue, using the provided references for further research, and studying the questions at the end of the issue.

Participants should select what they believe to be the correct answers, then refer to the list of correct answers to test their knowledge. To clarify confusion surrounding any questions answered incorrectly, please consult the source material.

After completing this semester's activity with the **June** issue, you must complete the evaluation form provided in that issue and return it in the reply envelope provided in order to receive a certificate of completion. When your evaluation is received, a certificate will be mailed to you. ■

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Participants who complete this activity will be able to:

- **identify** clinical, regulatory, or social issues relating to ED nursing;
- **describe** how those issues affect nursing service delivery;
- **integrate** practical solutions to problems and information into the ED nurse's daily practices, according to advice from nationally recognized experts.

1. Which is true regarding administration of antibiotics to pneumonia patients, according to Johanna Bruner, MS, RN, FNP?
  - A. Abnormal lab findings should not be used to determine the necessary level of care.
  - B. Initiating orders at triage is potentially dangerous to patients.
  - C. Antibiotics should be given based on the patient's presentation and symptoms if pneumonia is diagnosed on a chest X-ray.
  - D. The first dose of antibiotics should be given in the ED only if the patient is held for more than six hours.
2. Which intervention is recommended for pediatric febrile illnesses, according to Rakesh D. Mistry, MD, MS?
  - A. Instruct parents not to administer antipyretics for over 48 hours.
  - B. Inform parents that fever should not last more than 72 hours.
  - C. Remember that almost all febrile illnesses resolve without additional nonscheduled return visits.
  - D. Educate parents to give adequate doses of antipyretics for prolonged fever.
3. Which is an acceptable method of rapid fluid delivery for pediatric patients, according to a study published in *Annals of Emergency Medicine*?
  - A. Either a pressure bag or a manual push-pull system.
  - B. Only a pressure bag.
  - C. Only a manual push-pull system.
  - D. A regular standard pump.
4. Which of the following describes the hyperdynamic phase of septic shock, according to Dana Jundt, MSN, C-PNP?
  - A. Capillary refill is near normal and peripheral pulses are easily palpated.
  - B. Altered mentation and lethargy.
  - C. Pale mottled skin.
  - D. Weak, thready pulse.

**Answers: 1. C; 2. D; 3. A; 4. A.**

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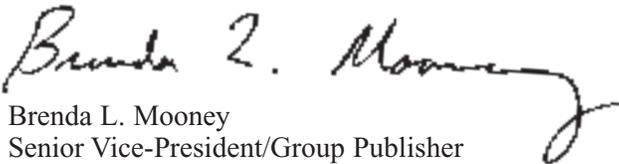
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