

Young patients with chest pain: 1-year outcomes

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Introduction

- Chest pain is the second most common presenting complaint to the emergency department .
- It accounts for approximately 8 million ED visits, but only 500 000 to 1200 000 of these patients are ultimately diagnosed with acute myocardial infarction.

- Young patients with AMI have different demographic characteristics and risk factors, more equivocal results on provocative testing, less severe coronary artery disease, and better cardiovascular outcomes relative to older patients with AMI.
- The distinctive characteristics of AMI in patients younger than 40 years suggest the approach to these patients should differ than the approach to old patients with similar symptoms.

- Patients without a cardiac history who had a normal electrocardiogram (ECG) and patients without a cardiac history who had no cardiac risk factors were both at less than 1% risk of 30-day adverse events.
- However, there are no data on the long-term cardiovascular outcomes of these young patients. The purpose of this study was to evaluate the 1-year adverse cardiovascular outcomes of young adult patients with chest pain.

Study design

- We conducted a prospective, observational study evaluating 1-year adverse cardiovascular events (death, AMI, percutaneous intervention [including angioplasty, stents, and coronary artery bypass graft]) of ED patients younger than 40 years who received an ECG for evaluation of potential ACS.

Study setting

- The study was performed in the ED of the Hospital of the University of Pennsylvania in Philadelphia between 2003 and 2007.

Participants

- Patients were excluded if they self-reported or tested positive for cocaine use because these patients are managed differently than other young patients with chest pain.
- Patients were also excluded if they had a history of coronary artery disease, congestive heart failure, myocardial infarction, or revascularization or they had cancer that would limit life expectancy to less than 1 year.

Study protocol

- Data collected included demographics, cardiac risk factors (hypertension, elevated cholesterol level, tobacco use, diabetes mellitus, and family history of premature coronary artery disease), cocaine use, and cardiac history.
- The duration, location, quality, and radiation of the pain and the presence or absence of associated symptoms were recorded.
- The recorded physical examination included the initial vital signs and the presence or absence of jugular venous distention, rales, or S4 heart sound.

the ECG into 1 of 7 categories:

- (1) normal—no evidence for ischemia;
- (2) nonspecific—abnormal T-wave axis in lead III, atrial fibrillation/flutter, nonspecific ST/Twave changes;
- (3) early repolarization—early repolarization changes without any other abnormalities; (4) abnormal but not diagnostic of ischemia
- (5) ischemia (old, unchanged ECG)
- (6) ischemia (not known to be old)
- (7) suggestive of myocardial infarction

Definitions

- A normal cardiac biomarker was defined as a cardiac troponin I level of less than 0.4 ng/mL .
- Normal ECG was defined as normal, nonspecific, or early repolarization only.
- One-year adverse cardiovascular events were defined as all-cause mortality, AMI, or revascularization.

Follow-up

- Follow-up was obtained by telephone, record review, and socialsecurity death index search.
- Our main outcome was 1-year adverse cardiovascular events (death; acute myocardial infarction; or revascularization—percutaneous coronary intervention or coronary artery bypass graft).
- Descriptive statistics and 95% confidence intervals were used.

Data Analysis

Table 1 Demographics and risk factors of study population

	n	%
Sex		
Male	258	42
Female	351	58
Age (y)		
Younger than 25	14	2
25-29	35	6
30-34	237	39
35-39	323	53
Race		
Asian	11	2
Black	423	69
Hispanic	14	2
White	156	26
Other	5	1
Cardiac risk factors		
Tobacco use	157	26
Hypertension	157	26
Family history of early CAD	62	10
Hypercholesterolemia	51	8
Diabetes mellitus	48	8
No. of cardiac risk factors		
None	288	47
1	211	35
2	75	12
≥2	35	6

CAD indicates coronary artery disease.

Table 2 Chest pain characteristics

	n	%
Location of chest pain		
Mid chest	275	45
Left arm/left chest	220	36
Right chest	45	7
Epigastrium	13	2
Other/unknown	56	9
Quality		
Pressure/tightness/crushing	234	38
Stabbing	184	30
Aching	74	12
Burning	37	6
Teasing	5	1
Other/unknown	75	12
Radiation of pain		
Left arm	105	17
Neck	34	6
Back	61	10
Right arm	37	6
Other	19	3
Associated symptoms		
Shortness of breath	275	45
Diaphoresis	87	14
Nausea	110	18
Vomiting	48	8
Lightheadedness	97	16
Syncope	16	3
Palpitations	81	13

Results

Table 3 Electrocardiogram interpretation for whole study population

	n	%
Interpretation for ischemia*		
Normal	427	79
Nonspecific	117	19
Early repolarization only	15	2
Abnormal but not diagnostic	28	5
Ischemia (known to be old)	3	<1
Ischemia (not known to be old)	14	2
Suggestive of AMI	4	<1
ST elevation		
None	580	95
1-2 mm	26	4
>2 mm	2	<1
ST depression		
None	592	97
0.5-1 mm	12	2
1-2 mm	4	<1
T-wave inversion		
None	521	86
Flattening	41	7
1-5 mm	45	7
>5 mm	1	<1
Hypertensive T waves >5 mm	6	1
Pathologic Q-waves	11	2
Right bundle-branch block	9	1
Left bundle-branch block	3	<1

* One was uninterpretable for review.

Table 4 One-year adverse cardiovascular event rates for the prespecified subgroups

	n	% (95% CI)
No cardiac history with a normal ECG (n = 560)		
A3-cause mortality	2	0.4 (0.04-1.3)
AMI	3	0.5 (0.1-1.6)
Percutaneous intervention	2	0.4 (0.04-1.3)
Composite cardiovascular events	6	1.1 (0.4-2.3)
No cardiac history or cardiac risk factors (n = 288)		
A3-cause mortality	0	0 (0-1.3)
AMI	1	0.3 (0.01-1.9)
Percutaneous intervention	1	0.3 (0.01-1.9)
Composite cardiovascular events	1	0.3 (0.01-1.9)
No cardiac history or cardiac risk factors, and a normal ECG (n = 269)		
A3-cause mortality	0	0 (0-1.4)
AMI	1	0.4 (0.01-2.1)
Percutaneous intervention	1	0.4 (0.01-2.1)
Composite cardiovascular events	1	0.4 (0.01-2.1)
No cardiac history, cardiac risk factors, a normal ECG, and initially normal cardiac markers (n = 268)		
A3-cause mortality	0	0 (0-1.4)
AMI	0	0 (0-1.4)
Percutaneous intervention	0	0 (0-1.4)
Composite cardiovascular events	0	0 (0-1.4)

Limitations

- We relied on self-reported use and optional urine screening at the physician's discretion to exclude these patients. Some patients who did not self-report use and did not receive urine screening may have been included in the study.
- As the patients are young, some cardiac risk factors such as diabetes mellitus or hypercholesterolemia may be present but have never been diagnosed and therefore are unknown to the patient.

- The use of all-cause mortality as an adverse cardiovascular outcome may have included patients who died of noncardiovascular causes.

Discussion

- Our study extends all these results to 1 year, suggesting that patients younger than 40 years are at extremely low risk of adverse cardiovascular events
- therefore, those patients who meet the specified criteria may be a candidate for discharge from the ED.

- patients with a normal or nonspecific ECG, no cardiac history, no cardiac risk factors, and initially normal cardiac markers, the risk of adverse cardiovascular events was 0%
- Use of these rules could identify a cohort of patients who may be candidates for discharge with a risk of less than 1% for 1-year adverse cardiovascular events, limiting unnecessary hospital admissions.

Clinical Policy: Critical Issues in the Evaluation of Adult Patients Presenting to the Emergency Department With Acute Blunt Abdominal Trauma

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Abstract

- A writing subcommittee reviewed the literature as part of the process to develop evidence-based recommendations to address 4 key critical questions
- (1) In a hemodynamically unstable patient with blunt abdominal trauma is ultrasound the diagnostic modality of choice?
- (2) Does oral contrast improve the diagnostic performance of CT in blunt abdominal trauma?

- (3) In a clinically stable patient with isolated blunt abdominal trauma, is it safe to discharge the patient after a negative abdominal CT scan result?
- (4) In patients with isolated blunt abdominal trauma, are there clinical predictors that allow the clinician to identify patients at low risk for adverse events who do not need an abdominal CT?
- Evidence was graded and recommendations were based on the available data in the medical literature related to the specific clinical question.

Introduction

- Review of the National Trauma Database reveals that abdominal trauma accounts for 13% of all injuries and is associated with a case rate mortality of 8%. Blunt abdominal trauma is the leading cause of these injuries.
- Despite the high prevalence of patients with blunt abdominal trauma, these patients present a clinical challenge. Physical examination may not be accurate because patients may have altered mental status or distracting injuries.

Methodology

- This clinical policy was created after careful review and critical analysis of the medical literature.
- Multiple searches of MEDLINE and the Cochrane database were performed.
- All searches were limited to English-language sources, human studies, and adults.

- Specific key words/phrases and years used in the searches are identified under each critical question.
- Thus, the level of evidence for any one study may vary according to the question, and it is possible for a single article to receive different levels of grading as different critical questions are answered.

- All articles used in the formulation of this clinical policy were graded by at least 2 subcommittee members for strength of evidence and classified by the subcommittee members into 3 classes of evidence on the basis of the design of the study.
- design 1 representing the strongest evidence and design 3 representing the weakest evidence for therapeutic, diagnostic, and prognostic clinical reports, respectively.

- **Level A recommendations.** Generally accepted principles for patient management that reflect a **high degree of clinical certainty**
- **Level B recommendations.** Recommendations for patient management that may identify a particular strategy or range of management strategies that reflect **moderate clinical certainty**
- **Level C recommendations.** Other strategies for patient management that are based on Class III studies, or in the absence of any adequate published literature, based on panel consensus.

- Recommendations offered in this policy are not intended to represent the only diagnostic and management options that the emergency physician should consider.
- American College of Emergency Physicians (ACEP) clearly recognizes the importance of the individual physician's judgment.

- **Scope of Application.** This guideline is intended for physicians working in hospital-based EDs.
- **Inclusion Criteria.** This guideline is intended for nonpregnant adult patients presenting to the ED with acute, blunt abdominal trauma.
- **Exclusion Criteria.** This guideline is not intended to address the care of pediatric patients or pregnant women.

1. In a hemodynamically unstable patient with blunt abdominal trauma is bedside ultrasound the diagnostic modality of choice?

- **Level A recommendations.** None specified.
- **Level B recommendations.** In hemodynamically unstable patients (systolic blood pressure 90 mm Hg) with blunt abdominal trauma, bedside ultrasound, when available, should be the initial diagnostic modality performed to identify the need for emergent laparotomy.
- **Level C recommendations.** None specified.

Key words/phrases for literature searches

- abdomen, ultrasound, sonography, abdominal injuries, nonpenetrating wounds, blunt abdominal trauma or injury, spleen trauma or injury, bladder trauma or injury, liver trauma or injury, splenic rupture, bowel or intestinal trauma or injury, kidney or renal trauma or injury, focused assessment sonography, focused abdominal sonography for trauma,
- years 1990-August 2008.

- Physicians in Germany and Japan use ultrasound as the primary diagnostic modality in unstable patients with blunt abdominal trauma.
- DPL and CT are diagnostic modalities used in hemodynamically unstable patients with blunt abdominal trauma in the United States.

- In a prospective Class II study by McKenney et al, published in 1996, 1,000 patients with blunt abdominal trauma were evaluated by ultrasound for injuries.
- The sensitivity of ultrasound was 88%, specificity was 99%, and the LR- was 0.12 in detecting intra-abdominal injuries as confirmed by CT, DPL, laparotomy, or observation.
- In another Class II study, Lentz et al studied 54 unstable patients with suspected blunt abdominal trauma who underwent an ultrasound followed by either DPL or laparotomy.

- The sensitivity and specificity of ultrasound for detecting free intraperitoneal fluid were 87% and 100%, respectively (LR- 0.14).
- The FAST scan performed by emergency physicians is not used to specifically identify parenchymal injury, but is used to identify the presence or absence of free fluid, secondarily diagnosing intra-abdominal injury associated with bleeding

- Fluid takes time to accumulate, so it is possible that an initial bedside ultrasound result may be negative, but if the examination is repeated later, the test result may be positive.
- serial ultrasounds can be helpful in patients with blunt abdominal trauma.
- A negative ultrasound result in hemodynamically unstable patients does not preclude the need for further diagnostic testing.
- diagnostic accuracy of bedside ultrasound may vary depending on ultrasonographer skill and equipment.

2. Does oral contrast improve the diagnostic performance of CT in blunt abdominal trauma?

- **Level A recommendations.** None specified.
- **Level B recommendations.** Oral contrast is not required in the diagnostic imaging for evaluation of blunt abdominal trauma.*
- *All of the studies reviewed included the use of intravenous (IV) contrast.
- **Level C recommendations.** For patients with a negative CT scan result with IV contrast only, in whom there is high suspicion of bowel injury, further evaluation or close follow-up is indicated.

Key words/phrases for literature searches

- blunt abdominal trauma or injury, abdomen, nonpenetrating wounds, noncontrast CT, oral contrast CT, contrast media, noncontrast CT, oral contrast CT, contrast media
- years 2002-August 2008.

- The study by Stafford et al (Class II study) continues to be the only prospective randomized trial comparing outcomes of patients who did or did not receive oral contrast.
- In this study, there were 500 trauma patients enrolled, 394 of whom were randomized. Of the 394 patients, 199 received oral contrast through a nasogastric tube, and 195 patients were randomized to no oral contrast (had IV contrast only).

- Stafford et al reported that for solid-organ injuries there was no difference between the oral contrast and no contrast groups. For oral contrast, 16 of 19 injuries identified 84.2% sensitivity.
- For patients with solid-organ injury who did not receive oral contrast (IV contrast only), 8 of 9 injuries identified 88.9% sensitivity.

- The average time from NG tube placement to CT scan was 3918 minutes for the IV-contrast-only group and 4624 minutes for the oral contrast group.
- The authors believed that the small time interval did not allow for transit of the contrast in the intestines, thus limiting the utility of oral contrast.
- Although this study was retrospective and did not directly evaluate the use of oral contrast, it adds to the body of evidence that IV-contrast-only CT was a useful tool in detecting bowel injuries that required operative management.

3. In a clinically stable patient with isolated blunt abdominal trauma, is it safe to discharge the patient after a negative abdominal CT scan result?

- **Level A recommendations.** None specified.
- **Level B recommendations.** Clinically stable patients with isolated blunt abdominal trauma can be safely discharged after a negative result for abdominal CT with IV contrast (with or without oral contrast).
- **Level C recommendations.** Further observation, close follow-up, and/or imaging may be warranted in select patients based on clinical judgment.

Key words/phrases for literature searches

- blunt abdominal trauma or injury, abdominal injuries, nonpenetrating wounds, CT, patient admission, hospitalization, patient discharge, patient disposition, prognosis, injury severity score, predictive value of tests, outcome, risk, years 1990-August 2008.

- Guidelines for the specific disposition of patients with blunt abdominal trauma from the ED are lacking.
- In Class III trial, Brasel et al evaluated a subgroup of patients with minor abdominal trauma who received a negative result for CT scan with IV and oral contrast.
- For 228 patients with a negative CT scan result, no patient had an abdominal injury.

- Jacobs et al, in a retrospective Class III study, evaluated 2,630 patients presenting with traumatic mechanism from April 1996 to March 1997.
- In the cohort of 566 of 1,147 (49.3%) patients with no previous testing and no CT scan performed, 0.3% had an abdominal injury.
- Of these 566 patients with a negative result for CT scan with IV contrast, 0.5% (2/422) had delayed diagnosis of an abdominal injury.

4. In patients with isolated blunt abdominal trauma, are there clinical predictors that allow the clinician to identify patients at low risk for adverse outcome who do not need an abdominal CT?

- **Level A recommendations.** None specified.
- **Level B recommendations.** None specified.
- **Level C recommendations.**

Patients with isolated abdominal trauma, for whom occult abdominal injury is being considered, are at low risk for adverse outcome and may not need abdominal CT scanning if the following are absent: abdominal tenderness, hypotension, altered mental status (Glasgow Coma Scale score 14), costal margin tenderness, abnormal chest radiograph, hematocrit 30% and hematuria.*

- *Hematuria is defined variably in different studies, with the lowest threshold being greater than or equal to 25 RBCs/high-power field (HPF).

Key words/phrases for literature searches

- blunt abdominal trauma or injury, abdominal injuries, nonpenetrating wounds, CT, physical examination, clinical decision rules, risk stratification, treatment outcome, predictor, risk assessment, low risk adverse events or complications, decisionmaking
- years 1990-August 2008.

- Multitrauma patients may have distracting extra-abdominal injuries that may make the physical examination unreliable for the detection of intra-abdominal injury.
- Studies have shown that only 10% to 24% of patients who have had CT scans for blunt abdominal trauma are found to have an intra-abdominal injury
- Identification of patients at very low risk for intraabdominal injury can possibly decrease overutilization of CT scanning.

- In a Class II prospective observational cohort, Holmes et al derived and validated a clinical prediction rule to identify very low-risk patients for intra-abdominal injury after blunt torso injury.
- Holmes et al enrolled adult patients aged 18 years or older and with blunt torso trauma who underwent a definitive diagnostic test (CT scan, DPL, laparoscopy, or laparotomy) to determine the presence or absence of intra-abdominal injury.
- Patients with penetrating trauma, pregnant patients, patients presenting in cardiopulmonary arrest, and patients with blunt torso trauma who did not undergo a definitive diagnostic test were excluded.

The derived prediction rule for identifying any intra-abdominal injury included:

- hematuria (25 RBCs/HPF)
- abnormal chest radiograph result (defined as pneumothorax or rib fracture)
- Glasgow Coma Scale score less than 14
- abdominal tenderness, costal margin tenderness, femur fracture
- hematocrit level less than 30%.

- With the above prediction rules, a negative prediction result would have avoided the use of CT scans in one third of the patients in the study.
- In a Class III study, Poletti et al studied hemodynamically stable patients with blunt abdominal trauma who received helical CT scanning to identify clinical criteria that could exclude intra-abdominal injury.

- Using clinical indicators:

Glasgow Coma Scale score 14, guarding, tenderness and laboratory values (AST > 50 IU/L, hematocrit level < 36, and WBC count > 10,000 mm³)

- as a screen for intra-abdominal injury, the study showed a sensitivity of 99%, specificity of 19%, PPV of 14%, NPV of 99%, and LR of 1.2.

Thanks for your listening~^^

