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Western Journal of Emergency Medicine

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The Birth of the Western Journal of Emergency Medicine: *West*JEM

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Welcome to the first issue of the *Western Journal of Emergency Medicine*, or *West*JEM.

This issue is the culmination of an ambitious plan to expand the scope, size, frequency and quality of the former *California Journal of Emergency Medicine* (*Cal*JEM). *Cal*JEM started publishing in 2000 as a joint venture of the University of California Departments/Divisions of Emergency Medicine (principally the Davis and Irvine campuses) and the California Chapter of the American Academy of Emergency Medicine (Cal-AAEM). The Cal-AAEM vision of sponsorship was, and remains to offer a quality academic product as a member benefit.

When Dr. Robert Rodriguez decided to step down after five years as Editor-in-Chief of *Cal*JEM, the Cal-AAEM Board of Directors enlisted my service as editor. Principally at the urging of Cal-AAEM President, Dr. Steven Gabaeff, an academic taskforce of leaders from emergency medicine (EM) residency programs in the Western United States was organized to promote and participate in the journal. Assessing the state of the journal, it became clear that CalJEM could be significantly expanded to accommodate the exponential growth of EM. As such, we explored the necessary steps to achieve indexing in the National Library of Medicine's Medline and PubMed database. Such indexing provides the most expansive access to published biomedical information in the world.

We set out to chart an aggressive course to make the journal worthy of PubMed consideration, a tall order. I was heartened to read that the *Canadian Journal of Emergency Medicine* became indexed in PubMed in November, 2006. Credit goes to Dr. Grant Innes and his editorial staff for seeing the journal from its formative stages through seven years as editor.[1]

To expand the scope of *Cal*JEM, we felt that we needed a name change along with a renewed focus, editorial board, format, size and distribution. We chose *West*JEM to maintain the California roots of the journal, with 14 EM training programs, while taking advantage of the Academic Task Force participation from 10 other Western training programs. Furthermore, we felt that the name would speak to academic EM programs from the Western Hemisphere, and to those in the Eastern Hemisphere who wanted to publish to a Western audience. Given the international growth of research in the specialty, particularly in Asia, we felt this name served several purposes. We will see if this works.

Regarding governance of the journal, the sponsorship remains equally with CAL/AAEM and the Department of Emergency Medicine at the University of California, Irvine. The journal is not owned by a multinational publishing company, as are the other four American EM journals. Hence it is "open access" and therefore free on line. With *West*JEM, you will never be teased by an interesting abstract, only to find that the publisher requires you to pay for the full text of the paper.

The mission of *West*JEM: Emphasize the practical over theoretical, focusing on the roles of technology and public health in efficient and optimal emergency care. We strive to be a journal for practicing emergency physicians, with a 21st century focus on technology, practice efficiency and the growing role of the specialty in promoting public health. Drawing on our independent roots, the **Vision of *West*JEM** is to be the premier open-access journal for emergency medicine in the Western Hemisphere. With *West*JEM, the on-line version will always be free.

One might ask, do we need a new journal? The answer in my mind is emphatically, "Yes!" A few comparisons are in order.

There are approximately 25-30,000 emergency physicians in the USA with four mainstream EM journals indexed in the PubMed database. By contrast, with approximately the same number of U.S. specialists, the number of indexed journals in cardiology (23), ophthalmology (20), pathology (18), radiology (11) and orthopedics (10) far exceeds that of EM.[2]

Next recognize that the last general EM journal in the U.S.

began publishing in 1994 (*Academic Emergency Medicine*) and that was the first new one in 11 years. In 1994 there were 103 ACGME-accredited EM residency programs in the U.S., while today there are 139 allopathic [3] and 32 osteopathic EM residencies,[4] greater than a 50% increase. In 1994 there were but 42 full academic departments in the nation's 124 medical schools. Today there are 72, a 58% increase.[5]

The research and scholarly work from these departments and training programs has increased proportionally. As evidence, the specialty's federal grant acquisition has grown from no listing on the NIH departmental ranking in 2002 (indicating less than 10 programs obtaining any funding) to a high of 19 programs with $8.2 million in funding in 2004, then a dip to 13 programs with $5.2 million in 2005, the last year data is available. Funded research generates a need for additional publication outlets.[6,7]

Consider that the proportion of SAEM national meeting abstracts accepted in 2007 was 46% (545/1172 submitted).[8] Couple that with the report that only 38% of 2,054 abstracts accepted to the meeting in 1997-2001 were ultimately published as full papers by fall 2003.[9] If 54% of research projects are rejected from our most influential national research meeting, and 62% of those accepted are never published as papers, then likely less than 20% of all research projects submitted to the meeting ultimately are published in manuscript form. While one could argue that the projects rejected from the research meeting or as full manuscripts did not pass rigorous peer review and are therefore not worth publishing, it appears that there is a clear imbalance between scholarly work and its wide dissemination in print.

Recently, academic leaders in EM have grappled with the place of EM research in the national fabric of research funding.[10] This group highlighted the synergy between the recent Institute of Medicine (IOM) reports describing the tenuous state of emergency care in the U.S.,[11, 12, 13] and the NIH roadmap for research funding.[14, 15, 16] The roadmap emphasizes, among other things, tightening the relationship between basic science and clinical research through the awarding of Clinical Translational Science Awards to research centers. The NIH has identified two barriers that inhibit the application of promising basic science approaches to treatment of disease, dubbed T1 and T2. T1 is the application of bench research results to clinical trials, for example, using a new drug or therapy in Phase I, II and III human studies, while T2 is the widespread dissemination of a proven treatment to the population. *West*JEM will provide an additional outlet for emergency physicians doing "bench to bedside" translational research. In addition, EM research is ideally suited to bridge the T2 barrier, as we care for more than 115 million patients per year in America's emergency departments (EDs), with every race, creed, color and age represented. There is no better crucible to disseminate bedside to population health than the ED. Hence, *West*JEM's focus on the role of public health is particularly suited to recent research evolution.

Recent published papers in the four American EM journals appear to focus on a narrow group of topics which does not span the breadth of EM practice or training. In the past three years, 474 papers, or 10 per issue, shared but 27 keyword topics in these journals. The topics are indeed important to our practice, led by acute myocardial infarction and chest pain with 117 papers, ranging down to HIV/testing and sexually transmitted diseases with seven total papers. Contrast this with the list of 878 clinical entities contained in the Model of Clinical Practice of Emergency Medicine[17] and it is evident that there is a significant gap between practice and (at least published) research. While it may be the nature of clinical research to limit what we study to common entities, nevertheless, an additional journal may expand the breadth of topics open to investigation and description.

*West*JEM will be available on-line through the University of California's, California Digital Library *e*Scholarship website. The *e*Scholarship Repository is a free, open-access infrastructure that offers UC departments, centers, and research units direct control over the creation and dissemination of the full range of their scholarship, including pre-publication materials, journals and peer-reviewed series, post-prints, and seminar papers. These materials are freely available to the public online at http://www.cdlib.org/programs/escholarship.html.

*West*JEM issues will be catalogued, maintained in perpetuity and accessible via common search engines like Google Scholar. Hence, even prior to indexing in PubMed, publication in *West*JEM will have wide and, more importantly, *free* distribution.

If you have read this far, then you are truly a supporter of innovative scholarly publications. I encourage you to read, comment, critique, argue, and submit your work to this new and exciting scholarly venture.

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I would like to acknowledge the dedication of Dr. Robert Derlet, founding editor of CalJEM, Dr. Antoine Kazzi, driving force and Managing Editor of the Journal from its inception until 2005, Dr. Robert Rodriguez, outgoing Editor-in-Chief, and Dr. Steve Gabaeff, whose collective vision started and promoted the journal to a level poised to take its place among the important and mainstream EM journals.

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Asthma: Effect of Genotype on Response to Therapy in the Emergency Department

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Objective: We examined the effect of two β2-adrenoreceptor (β2AR) polymorphisms (A46G and C79G) in asthmatics presenting to the Emergency Department (ED) in relation to their response to standard therapy measured by change in Forced Expiratory Volume at one second (FEV1). Our hypothesis was that the polymorphisms in the β2AR gene would predict clinical response to therapy with 46G and 79C displaying decreased response to inhaled therapy.

Methods: This was a pilot feasibility study of a convenience sample of patients seen in the ED for acute exacerbation of asthma. Baseline data collected included: age, gender, ethnicity, vital signs, baseline FEV1, body mass index (BMI), smoking history and medications taken prior to arrival to the ED. Patients received standard ED care and FEV1 was measured after each treatment. Blood was taken and genotyped.

Results: Fifty-three patients were enrolled over a three-month period. Using mean improvement in FEV1 from baseline to the first treatment as the primary outcome of interest, we performed multivariable linear regression analyses, with the FEV1 change as the dependent variable. When modeled as an ordinal covariate representing the number of G alleles present, there was a significant positive trend for the C79G locus (p=0.035). Those who were GG homozygotes had a 0.284 L/min improvement in FEV1 (31%) after their initial albuterol treatment compared to 0.123 L/min (12%) in those who were CC homozygotes. This represents a 2.5 times relative difference and a 19% actual difference. Genotypes at the A46G locus were not associated with FEV1 change.

Conclusion: In this pilot study of ED patients with acute asthma exacerbation, there was a significant effect of genotype on response to therapy.
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INTRODUCTION

Asthma accounts for more than 1.5 million Emergency Department (ED) visits, one-third of whom are admitted, and more than 5,500 (0.4%) deaths per year.[1] In the setting of acute asthma exacerbation in the ED, inhaled β2-adrenergic agonists, such as albuterol, are the mainstay of treatment. Unfortunately, wide variation exists in how individual patients respond to therapy, a phenomenon well known to emergency physicians. The finding that there are common functional genetic variants of the β2- adrenoreceptor (β2AR) has led to the suggestion that response to therapy may vary from individual to individual depending upon their genotypic makeup.[2,3,4,5,6]

Single nucleotide polymorphisms (SNPs) are common, single-base pair variations in the DNA. There are some 1.4 million SNPs in the human genome, 60,000 of which are in coding regions. The β2AR gene is located on the long arm of chromosome 5, and thirteen SNPs have been identified in the gene. Two closely linked coding polymorphisms at amino acid positions 16 (A46G) and 27 (C79G) are common

in the general population and in controlled outpatient trials have demonstrated to modify the phenotypic response to β2- agonists (46G and 79C being associated with decreased response to inhaled therapy).[2]

In this feasibility study, we examined these two SNPs in an asthmatic population presenting for acute care in the ED. Our goal was to determine whether different genotypes at these two genetic loci affected response to β2-agonists as measured by forced expiratory volume at one second (FEV1).

METHODS

This was an IRB-approved feasibility study of a convenience sample of patients seen in the ED for acute exacerbation of previously diagnosed asthma. Patients for this study were recruited in the ED of a large urban facility serving a local population of some 1.5 million individuals. Patients meeting inclusion criteria were consented and baseline data were obtained, including, age, ethnicity, height (cms) and weight (kg), BMI (kg/m2), smoking history (current, past, never), medication used prior to arrival, and past medical history. An initial set of vital signs including blood pressure (mmHg), respiratory rate and pulse rate as well as pulse oximetry (%) was collected. Prior to the initiation of therapy we also measured FEV1 using incentive spirometery (MicroSpirometer) with the best of three consecutive measurements.

Patients then received standardized care with albuterol-inhaled therapy, receiving 5.0 mg via a hand-held nebulizer every 20 minutes for a total of four treatments. Patients also received 60 mg of prednisone P.O. after the first inhaled treatment. Patients were not administered any other inhaled medications until after completion of the study protocol. Immediately after each inhaled treatment, the patient was reexamined and FEV1 measurements were obtained.

Study patients also underwent phlebotomy to obtain one 10ml green top tube (heparinized vacutainer) for genotype testing. For processing, we utilized an automated specimen component dispensing machine (the Cryo-Bio System). DNA extraction was accomplished on an ongoing basis using the Qiagen 96 DNA Blood Biorobotic Kit.

Genotyping assays were performed using the Taqman assay. Allele-specific probes for use in the TaqMan assay were designed for each of the polymorphic sites within the genes of interest. The oligonucleotide primers for amplification of the polymorphic region are:
5': CCCAGCCAGTGCGCTTACCT and
3': CCGTCTGCAGACGCTCGAAC (18).

β2AR A(46)G probes used to detect each of the alleles are:
GCACCCAATGGAAGCCATG and
GCACCCAATACAAGCCATG (21).

β2AR C(79)G probes used to detect each of the alleles are:
GTCACGCAGCAAAGGGACG and
GTCACGCAGGAAAGGGACTG (21).

Statistical Analysis

Outcome variables included five separate measurements (one measurement prior to treatment and four measurements after treatment 20 minutes apart) of FEV1. Data analysis related the degree of improvement in FEV1 to the polymorphisms seen in the ß2-adrenoreceptor at the two loci in question—A46G (AA homozygyotes, AG heterozygotes, and GG homozygotes) and C79G (CC, CG, and GG). Demographic variables including, age, gender, ethnicity, smoking history, height, weight, body mass index, and medication profile were also considered in our analysis.

Our analyses consider the absolute difference between baseline FEV1 (immediately ***before*** the first inhaled treatment) and that measured at time #1 (immediately ***after*** the first inhaled treatment) as the primary outcome measure of interest since it was noted in exploratory analyses that subsequent FEV1s (at post-treatments #2 – 4) were highly correlated with the first post-treatment measurement, FEV1 #1 (p-value for all <0.0001 with Pearson correlation coefficients ranging from 0.92 – 0.96).

We used analysis of variance to test for differences in the mean FEV1 change among the genotypes at each locus. To adjust for potentially confounding covariates, we also performed multivariable linear regression analyses, with the FEV1 change (first post-treatment minus baseline) as the dependent variable. The independent variables included the two genetic loci as well as the covariates listed above. In the regression model, the genotypes were modeled as the number of 'G' alleles present (0,1,2).

RESULTS

Fifty-three patients were enrolled over a three-month period (Table 1). Twenty-one of these were male and the mean age was 39.7 years (range 19-57 years). Mean baseline FEV1 was 1.17 L/min (range 0.33 to 2.59 L/min) and improved to a mean of 1.42 L/min (range 0.29 – 3.15) after the first inhaled treatment. Our preliminary analyses revealed that particular polymorphisms were highly correlated such that the presence of a given allele at one locus could predict the allele at the other locus (i.e., the two were in linkage disequilibrium). Specifically, individuals homozygous for the 'A' allele at locus 46 were in all instances homozygous for the 'G' allele at locus 79.

Those individuals who were 79GG homozygotes had a 0.284 L/min improvement in FEV1 (31%) after their initial albuterol treatment compared to 0.123 L/min (12%) in those who were CC homozygotes. This represents a 2.5 times relative difference and a 19% actual difference (Figure 1).

Table 1. Characteristics of the individuals included in FEV analyses (n=54)

Category Predictor	Number * (#) or Mean	Percent (%) or Std. Dev.	Range
DEMOGRAPHICS			
Ethnicity			
African-American	11	20.4%	
Caucasian	6	11.1%	
Latino/Latina	36	66.7%	
Age	39.9	10.8	19-57
Gender			
Male	21	38.9%	
Female	32	59.3%	
GENOTYPE			
A46G Genotype[1]			
AA	13	24.1%	
AG	29	59.3%	
GG	11	20.4%	
C79G Genotype[2]			
CC	4	7.4%	
CG	12	22.2%	
GG	38	70.4%	
COVARIATES			
Smoking			
Current	17	31.5%	
Past	16	29.6%	
Never	20	37.0%	
Body Mass Index			
Height (cm)	167.8	31.5	142.2-193.0
Weight (kg)	89.0	25.6	52-163.6
BMI (kg/m^2)	31.6	8.3	18.5-56.6
Inhaled Asthma Medications Prior to Arrival			
None	18	33.3%	
Yes	35	66.6%	
OUTCOME			
Forced Expiratory Volume			
Baseline FEV (n=50)	1.16	0.63	0.33-2.59
FEV, time #1 (n=52)	1.41	0.68	0.29-3.15
FEV, time #2 (n=52)	1.54	0.67	0.27-2.95
FEV, time #3 (n=48)	1.53	0.67	0.25-3.17
FEV, time #4 (n=38)	1.62	0.76	0.25-3.17
Disposition			
Home		53	100%

[1]A46G Genotype Frequency A: 0.52, G: 0.48

[2]C79G Genotype Frequency C: 0.19, G: 0.81

*Numbers may not add to total sample size due to missing genotype data.

When modeled as an ordinal covariate representing the number of 'G' alleles present, there was a significant positive trend for FEV1 change with increasing numbers of 'G' alleles at the C79G locus (p=0.035). Genotypes at the A46G locus were not associated with FEV1 change in either regression model.

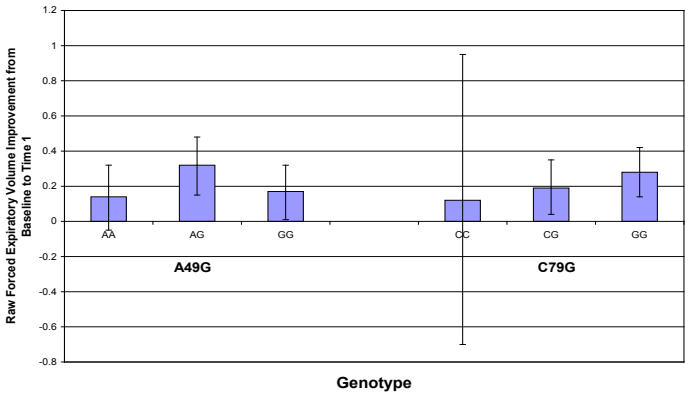

Figure 1. Mean values of FEV difference between baseline and Time 1 stratified by locus and genotype.95% confidence intervals are represented by the error bars.

DISCUSSION

β-agonists are the most commonly prescribed asthma medications and the mainstay of therapy in the treatment of acute exacerbation in the ED.[8] The candidate gene approach, which has proved so challenging for complex disease processes such as hypertension, diabetes and cancer, has been fairly successful in identifying variation involved in the treatment of asthma. SNPs have been identified that have pharmacologic implications with regards to response to β_2 agonists, muscarinic antagonists, 5-LOX inhibitors, CysLT1 antagonists, glucocortocoids, and theophylline.[6] Two of the multiple β_2-agonists SNP's (A46G and C79G) described in the literature are more common than the others and thus, we believe, more clinically relevant.[2,6,7]

The first polymorphism, A46G, has been linked to higher levels of receptor down regulation after exposure to long-term β_2-agonist therapy.[3,4] Studies have shown that patients with a 'G' allele have increased nocturnal asthma symptoms, higher airway reactivity, and decreased response to β_2-agonist therapy.[5] In the setting of an acute asthma exacerbation, these patients may need to resort to alternative forms of management such as corticosteroids or anticholinergics. It has also been suggested that individuals who die due to their asthma represent a group of 46G homozygotes, brittle asthmatics with desensitization of their β_2 receptor.[9]

The second polymorphism, C79G, appears to serve in protection against desensitization and/or down regulation of the receptor.[3,4] Patients with the 79G polymorphism exhibit decreased bronchial hyperactivity. Of note, when both the 46G and 79G polymorphisms were present, 46G activity was dominant over 79G in down regulating β_2-adrenoreceptors and more prevalent in moderate vs. mild asthmatics.[10]

In our study, as patients increased the number of copies of 79C in their β_2AR gene, their response to inhaled therapy of β_2-agonists decreased by almost 20%. Interestingly, we were not able to demonstrate an effect of the A46G locus on patients' response to albuterol therapy as measured by FEV1. One explanation for this may be tachyphylaxis in these acutely stressed asthmatics. Given that the β_2AR in these patients is most likely "pre-desensitized" by endogenous epinephrine and norepinephrine, the lack of a measurable difference is not unexpected.

LIMITATIONS

The primary limitation of this pilot study is the small number of individuals who were 79C homozygotes. In addition the results may have been influenced by the large percentage of patients who received medications prior to contact with EMS or the ED. Their response to therapy may have been attenuated by these prior medications.

CONCLUSION

In this study of acute asthmatics we found a significantly higher rate of improvement for those patients who were 79GG homozygotes in the β_2AR gene when compared to 79CC homozygotes. While the need to have information about a patient's genotype in an acute care setting such as the ED may not be self-evident, it is the promise of effective patient-specific therapies and the hope of obtaining prognostic information from a patient's genotype that appeals most to the physicians involved in the acute care of patients. Such information may allow a goal-directed approach for individual patients and will allow the practitioner to predict the clinical course over the initial two- to four-hour time period of emergency care. In the setting of asthma, the long term potential of such information may be measured by fewer intubations, fewer hospitalizations and fewer deaths.[1]

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The Holy Grail, Genes and Number Needed to Treat

"According to Christian mythology, the Holy Grail was the dish, plate, or cup used by Jesus at the Last Supper, said to possess miraculous powers." Wikipedia

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In this month's *West*JEM, Henderson and colleagues report on a preliminary study of the genetics of asthma therapy[1]. It seems like a simple enough piece, short, to the point, preliminary, not earth-shattering, and yet it points to a brave new world, an emerging area of medicine that holds great promise. This is about targeting therapy, really targeting therapy, dropping the number needed to treat (NNT) as low as possible, and dreaming of a number close to one.

Today in medicine we accept that we must treat many patients with therapies to benefit just a few. We accept that of the many treated, many will have side effects and gain no benefit. We even accept that some therapies will kill patients almost as often as it cures them[2]. We accept that with thrombolytic therapy for myocardial infarction we need to treat between 40 to 100 souls to benefit one person. In patients with hypertension we may need to treat hundreds of patients for many years before we prevent one death. We accept it, but we do not like it.

In Henderson et al's paper, the target disease is asthma, the treatment is albuterol and the question is, "Can we determine with genetic testing which patients are likely to respond and which are not?" The study suggests that some patients are less or more likely to respond to albuterol and this can be predicted by their specific genetic profile. It could be argued, and indeed should, that the differences found in the study are of questionable clinical significance. Does a difference of 19% in FEV1 really matter? This was not the point of the study, but it will be an important question as these studies become more prevalent. Does knowing this patient's genetic profile really change my management or similarly should it change my management?

It is no secret to the practicing clinician that some patients respond very well to a variety of therapies while others appear to gain no benefit. In asthma we have all seen the patient given multiple albuterol treatments to no avail. At the same time the patient about to have a respiratory arrest is given just a few treatments and responds remarkably well. There is clearly a variety of factors that predict response to therapy: the patient's age, sex, race, prior therapies, smoking history, etc. At least part of what we are doing by collecting such data as sex and race is genetic profiling. We are searching for those patients with the right receptors to our therapy by using the blunt instrument of historical and epidemiologic data. Genetic testing promises to focus this effort.

While this area is still in its infancy (the human genome project was completed just four years ago), some remarkable data has been collected. In one study of heart failure, a specific genotype was associated with *dramatic* improvements in LV function when these patients were treated with beta-blockers, while others gained relatively little effect[3].

In the end this is all about NNT. Clinicians are crying out for new information that can allow them to target therapies to the specific groups likely to gain the most benefit. We long for the Holy Grail, the number needed to treat of one.

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A Prospective, Randomized Trial in the Emergency Department of Suggestive Audio-Therapy under Deep Sedation for Smoking Cessation

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Objectives: In a sample of patients undergoing procedural deep sedation in the emergency department (ED), we conducted a prospective, randomized, single-blinded trial of audio-therapy for smoking cessation.

Methods: We asked subjects about their smoking, including desire to quit (0-10 numerical scale) and number of cigarettes smoked per day. Subjects were randomized to either a control tape (music alone) or a tape with repeated smoking-cessation messages over music. Tapes were started with first doses of sedation and stopped with patient arousal. Telephone follow-up occurred between two weeks and three months to assess the number of cigarettes smoked per day. Study endpoints were self-reported complete cessation and decrease of half or more in total cigarettes smoked per day.

Results: One hundred eleven patients were enrolled in the study, 54 to intervention and 57 to control. Mean desire to quit was 7.15 ± 2.6 and mean cigarettes per day was 17.5 ± 12.1. We successfully contacted 69 (62%) patients. Twenty-seven percent of intervention and 26% of control patients quit (mean difference = 1%; 95% CI: –22.0% to 18.8%). Thirty-seven percent of intervention and 51% of control patients decreased smoking by half or more (mean difference = 14.6%; 95% CI: –8.7% to 35.6%).

Conclusion: Suggestive audio-therapy delivered during deep sedation in the ED did not significantly decrease self-reported smoking behavior.
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INTRODUCTION

Cigarette smoking is the leading modifiable cause of disease in the United States.[1] Approximately 440,000 people die annually of cigarette smoking-related causes, with an associated 5.6 million years of potential life lost. At least $75 billion are spent in the treatment of smoking-related illness.[2] It is estimated that 8.6 million Americans have serious illnesses attributed to smoking, and about 10% of all current and former adult smokers have a smoking-attributable chronic illness.[3] The burden of smoking-related disease is seen in all healthcare settings, including the emergency department (ED).[4,5]

Smoking cessation was noted as a national priority for health promotion and disease prevention in Healthy People 2000 and 2010.[6] Public health authorities in emergency medicine have likewise called for ED–based randomized trials and other interventions.[4,5,7] A variety of techniques have been proposed to assist people to quit smoking, and there have been trials suggesting roles for hypnosis and suggestion-based methods for smoking cessation.[8-12] Studies of smoking-cessation messages administered by tape recordings (suggestive audio-therapy) delivered during general anesthesia have produced variable results.[13-15] Myles[14] found significant reductions in overall amount of smoking in patients randomized to intervention in one study, but Myles et al[15] failed to demonstrate significant changes in smoking in a second trial. The purpose of our study was to test the hypothesis that suggestive audio-therapy delivered

during deep sedation in the ED would decrease subsequent self-reported smoking.

METHODS

Study Design, Setting and Population

This study was a prospective, randomized, single-blinded trial. The two endpoints were complete smoking cessation and a decrease of >50% in the number of cigarettes smoked per day comparing subjects' pre- and post-intervention self-reports. The study was conducted from January 2001 to December 2003 at an urban, county hospital ED with an annual census of approximately 70,000 patients. All adult smokers undergoing procedural deep sedation were eligible for enrollment. The exclusion criteria were: 1) no desire to quit smoking defined as 0 on a 0-10 numerical scale; 2) hearing impairment to the degree that the subject could not hear an audiotape; 3) poor English-language comprehension; and 4) developmental delay, dementia, delirium or current psychiatric illness precluding adequate informed consent. Patients were enrolled when the investigators and research assistants were available, from 8 AM to 8 PM on weekdays.

Study Protocol

Tape Preparation

Thirty minutes of music (Pachelbel's Canon) was recorded on the control tape. On the intervention tape, after one minute of the music, a scripted smoking-cessation message was recorded by a neurolinguistic professional over the background music. This smoking-cessation message had been used during hypnosis therapy for smoking cessation but had not been validated in any manner. Tapes were labeled "A" (intervention) and "B" (control) by an investigator who was blinded to tape assignment. Tapes were periodically assessed for clarity by clerks who were not involved in the study.

Consent, Randomization, and Enrollment

The institutional review board at our hospital approved the study. All patients undergoing deep sedation during the investigators' and research assistants' hours were asked if they smoked cigarettes and if they had any desire to quit. Those who wanted to quit and agreed to participate in the study provided written informed consent. No monetary compensation was offered for participation. Patients were randomized according to a computer-generated random sequence of the letters A and B.

Intervention

In addition to standard demographic questions, subjects were asked about their daily cigarette use and to rate their desire to quit on a numerical rating scale, in which 0 = no desire to quit and 10 = extreme desire to quit. Headphones were placed over subjects' ears; volume was adjusted during the first minute of equivalent tape so that subjects could hear but investigators could not. Tapes were then stopped and restarted with onset of sedation. The mean total tape playing time was 17.3 ± 4.6 minutes. Tapes were played throughout deep-sedation procedures and terminated on arousal. All patients underwent deep sedation with a sedative and an analgesic: most commonly, propofol at a mean dose of 189 mg and fentanyl at a mean dose of 182 mcg. Sedatives and analgesics were delivered as intermittent boluses according to the ED's standard deep-sedation protocol, titrating agents to procedural sedation scores of 3 (4-point scale), corresponding to "minimal or no withdrawal to painful stimulus."

After arousal, subjects were asked if they remembered any portion of the procedure. To preserve blinding of investigators and avoid introduction of bias, subjects were not asked whether they remembered any message delivered by the tapes. Before discharge from the ED, subjects were asked to give their best phone number for contact and were informed that research assistants would be calling them for follow up.

Follow up

Investigators blinded to tape assignment attempted to contact all subjects by telephone beginning two weeks after the ED visit. At least five attempts were made to contact subjects over three months. During follow-up calls, subjects were asked again to quantify their daily cigarette consumption using a standardized data collection instrument.

Data Analysis

Based on a baseline decrease in smoking of approximately 25% (estimated placebo effect for the control group), a clinically important decrease in smoking between groups of 20%, a power of 80%, a significance level of 0.05, and a one-sided analysis, we calculated a sample size of a total of 138 subjects. A midway interim analysis was planned after 69 patients to determine potential utility versus futility—defined a priori as a less than 10% chance that the study would demonstrate significant benefit with completion of the original sample size. Baseline characteristics were analyzed using the chi-square test, the Fisher exact test, and the Student's t test, as indicated. The primary outcome measures were reported as the mean difference between groups with 95% confidence intervals. Data was entered using Microsoft Excel (Microsoft Corporation, Redmond, WA) and analyzed using STATA 7.0 (Stata Corporation, College Station, TX).

RESULTS

The study was stopped because of futility. One hundred eleven subjects were enrolled (Table 1). Fifty-four subjects were randomized to the intervention tape, and 57 to the control tape (Figure). Fifty-three percent of intervention-group and 72% of control-group subjects had quit smoking at some time in the past (Table 2). The most frequent method used was

Table 1. Characteristics of participants in the study

Characteristic	Number (%)
Number of participants	111
Age, years ± SD	39.5 ± 9.8
Median (range)	42 (22-61)
Female sex	51 (46)
Race/ethnicity	
African American	63 (57)
White, non-Latino	26 (23)
Latino	12 (11)
Other and undeclared	10 (9)
Procedure performed	
Abscess I&D	88 (79)
Orthopedic reduction or relocation	23 (21)
Cigarettes per day ± SD	17.5 ± 12.1
Median (range)	15 (1-70)
Years of smoking ± SD	21.7 ±12.2
Median (range)	25 (4–47)
Desire to quit ± SD	7.2 ± 2.6
Median (range)	6 (1–10)

I&D = incision and drainage; SD = standard deviation. Desire to quit was assessed using 0–10 numerical rating scale.

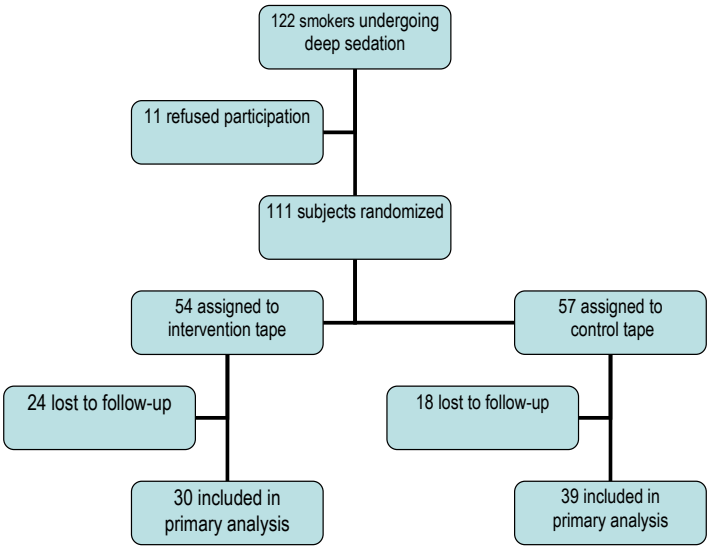

Figure. Flow of screening, enrollment, and follow-up of participants.

"cold turkey." Only six (5%) patients from both groups recalled any part of the painful procedure.

Follow up was completed on 62.2% (69/111) of subjects. The control and intervention groups with complete follow up were similar in demographics, proportion that had tried to quit smoking, desire to quit at baseline, and magnitude of smoking (Table 2). There was no significant difference between groups in proportion lost to follow up.

For the primary endpoints, no significant differences were found between groups. Eight of 30 (27%) subjects randomized to the intervention tape (A) and 10 of 39 (26%) subjects randomized to the control tape (B) reported complete cessation (mean difference in proportions = 1%; 95% confidence interval (CI): –22.0% to 18.8%). Eleven of 30 (36.7%) intervention patients and 20 of 39 (51.3%) control patients reported a decrease in daily smoking by 50% or more (mean difference in proportions = 14.6%; 95% CI: –8.7% to 35.6%).

DISCUSSION

In this prospective, single-blinded, randomized controlled trial, audio-therapy delivered under deep sedation did not decrease self-reported smoking behavior. There are multiple possible explanations. The subjects in this study included a large percentage of patients with a history of current injection drug use (most of whom underwent abscess incision and drainage). Such a group may be less amenable to any treatments for addiction. Other potential causes for the failure include ineffectiveness of the scripted message and a level of sedation too deep to allow reception of the message or learning. In addition, subjects may have declared high motivation to quit despite poor true motivation because of the Hawthorne effect—the change in behavior that results from subjects' knowledge that they are being studied.

Given that the control group trended toward better results, it is possible, although extremely unlikely, that continuing enrollment to our primary projection of sample size would have resulted in a detectable significant decrease in smoking in the intervention group. Incomplete follow up limited our final sample size for analysis, but our telephone follow-up rate of 60% is comparable to telephone follow-up rates in other ED studies, including another smoking-cessation trial.[16,17]

The most likely reason for failure to show benefit may be that audio-therapy delivered once over a brief period is simply ineffective at treating smoking addiction. The efficacy of hypnosis itself for smoking cessation is suspect; examinations of hypnosis and other suggestive therapy techniques have produced inconsistent results.[8-15,18,19] In a review of 59 studies of hypnosis and smoking cessation, Green and Lynn determined that the evidence was inconclusive, and they classified hypnosis techniques as being only "possibly efficacious." [11] A Cochrane systematic review similarly found marked heterogeneity in studies and concluded that there is no evidence that hypnotherapy is superior to other interventions.[19]

Cigarette smoking is an extremely potent addiction, one that

Table 2. Study subjects in whom follow-up was achieved

Characteristic	Intervention (n=30)	Control (n=39)
	Number (%) or Mean ± SD	
Age, years	41.9 ± 8.6	39.2 ± 10.9
Female sex	13 (43)	19 (49)
Procedures performed		
Abscess I&D	24 (80)	31 (79)
Orthopedic reduction or relocation	6 (20)	8 (21)
Quit smoking in the past	16 (53)	28 (72)
Desire to quit smoking	6.54 ± 3.1	7.62 ± 2.1
Years smoked	21.1 ± 10.6	22.2 ± 13.2
Cigarettes per day before tape	18.1 ± 11.9	17.1 ± 12.6

I&D = incision and drainage; SD = standard deviation. Desire to quit was assessed using 0–10 numerical rating scale.

may require a long-term, multifaceted approach for quitting; nicotine replacement in the form of patches or gum is likely necessary to treat the physical dependence. Law[20] in a systematic review of smoking-cessation interventions determined that only 2% of smokers stopped the behavior for a year as a direct consequence of personal advice by their physician, but Jorenby et al[21] found that nicotine replacement therapy in the form of patches or gum was effective for smoking cessation in 13% of smokers in a placebo-controlled trial. It is possible that hypnosis and audio-suggestive intervention still may play a role in conjunction with such measures directed at physical dependence.[22]

Other investigators have defined the prevalence of smokers,[5] noted the substantial effect that smoking has on emergency care,[4] and issued a call for "teaching moments" and randomized trials in the ED.[4,5,7] In another ED–based study, however, Richman et al[17] found that providing patients with a scripted counseling message did not result in a change in smoking behavior. Despite the failure to show benefit in the Richman study and in our trial, physicians in urgent care clinics, EDs and other non-continuity of care settings must continue to advocate for smoking cessation and other preventive-care measures. These are the only healthcare access points for millions of Americans, providing primary care (often the only care) for a large segment of the population. A need and desire for preventive care through the ED has been demonstrated,[23] and multiple successful preventive-care initiatives have been implemented.[24-28] It is essential that innovative trials aimed at provision of preventive care in EDs and urgent care clinics continue.

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Educational Assessment of Medical Student Rotation in Emergency Ultrasound

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Background: Medical student ultrasound education is sparse. In 2002, we began the first medical student rotation in emergency ultrasound.

Objective: To evaluate if medical students can learn and retain sonographic skills during a two- or four-week elective.

Methods: We gave students an exam on the first and last days of the rotation. Six months later, students took the exam a third time. A control group was used for comparison.

Results: Over a 19-month period, we enrolled 45 students (25 on the two-week and 20 on the four-week elective). The four-week student post-test score was significantly better than the two- week post-test score (81% vs 72%, p=0.003). On the six-month exam, the four-week student post-test score was significantly better than the two-week post-test score (77% vs 69%, p=0.008). The control group did not statistically improve.

Conclusion: Medical students can learn bedside ultrasound interpretation with clinical integration and retain the knowledge six months later.
[*West*JEM. 2007;8:84-87.]

BACKGROUND

Emergency physicians (EPs) have used bedside ultrasound for almost two decades[1,2] with studies demonstrating its accuracy and utility.[3-15] Bedside ultrasound is required for residency training in Emergency Medicine (EM)[6] and is used in other specialties, but it is not routinely taught in U.S. medical schools. Several studies have evaluated emergency ultrasound (EU) curricula for resident and practicing physicians, but this is the first study to address medical student learning in emergency ultrasound. [16-19]

We established the first Emergency Department (ED)-based, fourth-year medical student rotation for EU in 2002. We offer both two- and four-week rotations. Each week includes two hours of didactics and five hours of image interpretation review (approximately 100 scans), the content of which varied during the study period according to patient variability and didactic scheduling. Each student spent 40 hours per week in the ED performing bedside ultrasounds with supervision by resident and attending EPs. This EM group consists of several registered diagnostic medical sonographer (RDMS) certified-

Table 1. Primary Applications for Emergency Ultrasound (American College of Emergency Physician guidelines[20])

Focused Assessment of Sonography in Trauma (FAST)
Ultrasound in pregnancy (intra-uterine pregnancy, fetal movement, cardiac activity
Abdominal Aortic Aneurysm
Emergency echocardiography
Biliary ultrasound
Renal ultrasound
Procedural ultrasound

physicians and other EPs who hold hospital credentialing in the interpretation of EU. Each student had the opportunity to work with a variety of attending EPs, including the emergency ultrasound fellow and the director of emergency ultrasound.

Purposes

We sought to determine if these rotations promote improved image interpretation and clinical integration, and whether these skills were retained six-months later. Furthermore, we hypothesized that students would score better after a four-week than a two-week rotation.

METHODS

We prospectively enrolled medical students over a 19-month period at our academic, urban, Level I trauma center ED. Informed consent was obtained from each student. We designed a 35-question exam, covering the primary applications of EU as described in the American College of Emergency Physicians Emergency Ultrasound Guidelines (Table 1).[20] In addition, we tested ocular ultrasound, detection of soft-tissue abscess, and deep venous thrombosis (DVT). Of the 35 questions, 13 assessed physics and image-acquisition techniques, 13 involved image interpretation with clinical integration, and nine were purely image interpretation, with the majority of the images demonstrating positive findings. An interactive DVD with live ultrasound video clips accompanied the exam (available on journal website at www.insertdvdtesthere.com). The university IRB committee approved the study.

We instructed students in ultrasound physics and instrumentation, and aortic, biliary, pelvic (transabdominal/endovaginal), renal, DVT, trauma, cardiac, soft tissue, and ocular ultrasound. Students also did four hours of DVD self-study in both rotations. Didactic and tape review instructors were RDMS-certified EM faculty and fellows. Finally, students were encouraged to read a 500-page collection of selected ultrasound textbook chapters and research articles.

On the first day of the elective, students were approached for enrollment whether on the two or four week rotation, and before any ultrasound instruction. None refused. We planned to exclude students if they had prior ultrasound instruction or experience. None did. Students took the exam on day one and again on the final day of their rotation. Six months after the completion of the rotation, a follow-up exam with DVD was mailed to the students to be completed at their convenience. The same exam was used each time, but students were blinded to both the correct answers and their previous score. Students who completed the six-month exam received a gift card for a large, multi-national coffee chain. Nine students who did not take the emergency ultrasound rotation (control group) took the same exam on two occasions four weeks apart. We calculated p-values using the Student's t-test, analysis of variance (ANOVA), and a linear regression model that included the pre-test score and a binary variable for the difference between the two and four week electives. Statistical significance was set at $p < 0.05$.

Table 2. Exam scores for control, and two and four week rotation students.

	Pre-test	Post-test	p=(t-test)
Control (n=9)	43%	39%	0.116 (ns)
2 week (n=25)	46%	72%	< 0.005
4 week (n=20)	47%	81%	< 0.005

* p=0.003 for post-test comparison of two and four week groups

Table 3. Exam scores of subset of two and four week rotation students who completed six-month follow-up, compared with the same students' pre-test scores

	Six-month follow-up scores	p=(t-test)
2 week (n=19)	69%	< 0.0005
4 week (n=15)	77%	< 0.0005

* p=0.008 for post-test comparison of two and four week groups

RESULTS

Over a 19-month period, we enrolled 45 students (25 on the two-week and 20 on the four-week elective). Their results are summarized in Table 2. Thirty-four of 45 students (76%) completed the six-month follow-up exam. Table 3 shows these results compared to the four-week group's pre-tests.

There was no difference between pre-test scores in the three groups (p=0.688 by ANOVA). However, there was a statistically significant improvement in the post-test scores for the four-week group as compared with the two-week group (p=0.005), as well as six-month follow-up scores between the groups (p=0.008). These two comparisons were made using linear regression controlling for pre-test scores. Therefore, not

only did scores improve after the two and four week rotations, but both groups retained this improved performance at the six-month follow up.

DISCUSSION

This study is the first to investigate the effectiveness of a medical student rotation in bedside ultrasound in the ED. Such education is broadly applicable outside of EM, including obstetrics and gynecology, surgery, critical care and office-based practices. Our results demonstrate that students have a significant increase in their ability to interpret ultrasound images and integrate them into clinical decision-making after a short period of training. Although the students on the four-week rotation showed a greater improvement than the two-week students at both the completion of the rotation and the six-month follow up, the two-week students nonetheless showed a significant improvement. These results suggest that incorporating ultrasound education into medical school curricula is feasible and can be successful in a short rotation.

More than 32,000 emergency physicians practice in the United States, but only a small fraction are ultrasound trained. A recent survey documents that ultrasound equipment is consistently available in only 19% of U.S. EDs.[21] The primary reason cited for this limited availability was lack of EP training. Our study of medical students suggests relatively short, focused periods of training are effective and may begin to bridge this training gap.

LIMITATIONS

This study tested image interpretation and integration into patient management but did not test actual image acquisition. Therefore, we cannot comment on whether two or four weeks of bedside training is sufficient to develop and retain these skills. As our exam addressed clinical management of patients based on ultrasound findings, we cannot separate ultrasound skills from improved clinical acumen during the rotation. It is possible that students who chose a four-week elective in EU are more motivated to learn EM than those choosing two weeks, and this could account for the improved test performance. Furthermore, an inclusion bias may be present; the 76% that chose to complete the six- month follow-up examination may have been the same students who were more motivated during the rotation and had greater retention of information.

The examination focused on detection of "positive" ultrasound findings suggestive of pathology. To most accurately assess image-interpretation skills, a more thorough exam would have consisted of multiple normal, abnormal and indeterminate examples for each indication; however, the investigators were concerned that a lengthier exam could have decreased the completion rate. Given that the pre- and post-test were identical, we cannot exclude improvement in scores based simply on taking the same test twice. However, our control group, with no ultrasound training did not improve their test scores, making this confounder unlikely. Due to the variable nature of the ED patient population, the bedside ultrasounds performed by the students and the images available for review during the image interpretation sessions were not controlled for and may have affected individual student performance on questions evaluating certain applications.

We also did not control for the number of scans that either group performed, the random variability in the proportion of each type of scan performed by each student, or any ultrasound experience following the post-test but preceding the six-month follow-up examination. Finally, this educational study was performed at only one site, and therefore generalizability is limited.

CONCLUSION

This study demonstrates that medical students are able to acquire skills necessary for image interpretation of fundamental emergency ultrasound applications and integrate this into clinical scenarios. A four-week rotation is superior to a two-week rotation. Students are able to retain a significant amount of their training six months after the rotation.

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The Basics of Alcohol Screening, Brief Intervention and Referral to Treatment in the Emergency Department

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Nearly eight million emergency department (ED) visits are attributed to alcohol every year in the United States. A substantial proportion is due to trauma. In 2005, 16,885 people were killed as a result of alcohol-related motor vehicle crashes. Patients with alcohol-use problems (AUPs) are not only more likely to drive after drinking but are also at greater risk for serious alcohol-related illness and injury. Emergency departments have an important and unique opportunity to identify these patients and intervene during the "teachable moment" of an ED visit. The American College of Emergency Physicians, Emergency Nurses Association, American College of Surgeons-Committee on Trauma, American Public Health Association, and the National Highway Traffic Safety Administration, have identified Alcohol Screening, Brief Intervention and Referral to Treatment (SBIRT) as a pivotal injury- and illness-prevention strategy to improve the health and well-being of ED patients. We provide a general overview of the basis and need for integrating SBIRT into EDs. Models of SBIRT, as well as benefits and challenges to its implementation, are also discussed.
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INTRODUCTION

In the United States (U.S.), someone is injured in an alcohol-related motor vehicle crash every two minutes, and every 31 minutes an alcohol-related crash fatality occurs.[1] In 2005, these crash fatalities accounted for 39% of the 43,443 national traffic deaths.[1] Between 1992 and 2000, U.S. emergency departments had more than 860 million visits. Emergency Department (ED) visits attributable to alcohol during the same period averaged nearly 8 million annually with an 18 % rise over nine years.[2] Alcohol intoxication remains a leading risk factor for injury.[3-5] Similarly, alcohol is implicated as an independent risk factor in a multitude of medical and psychiatric conditions (e.g. cancer, community-acquired pneumonia, cardiomyopathy, gastrointestinal, liver disease, pancreatitis, anxiety disorder, depression, schizophrenia)[6-10]. More recent studies have implicated alcohol in other life-threatening events, such as intracerebral hemorrhage in younger adults.[11]

Alcohol's impact on the public's health is detrimental, and there is considerable need to mitigate alcohol-related illness and injury. Applying the public health model to the readily identified burden results in preventive measures such as Alcohol Screening, Brief Intervention and Referral to Treatment (SBIRT).

Although organized pre-hospital care and regionalization of trauma centers have saved tens of thousands of lives over the past 30 years, further progress through injury prevention will save the greatest number of lives in the shortest period of time.[12, 13] SBIRT is one important prevention strategy that has great potential to make a significant impact in the health and well-being of ED patients.

What Is SBIRT?

In the last decade, SBIRT in EDs has gained significant momentum and acceptance. SBIRT allows medical and nursing professionals or specially trained personnel to quickly and effectively survey patients regarding their alcohol-use habits (quantity and frequency) and categorize them as a non-drinker, drinker not at risk, drinker at risk or alcohol dependent. Survey tools commonly used in SBIRT have been validated in multiple settings worldwide. These questionnaires gather information about a patient's drinking frequency, habits and experiences. Today, the two survey tools most commonly used in the ED are the CAGE questionnaire and the Alcohol Use Identification Test (AUDIT) (Table 1 and Figure 1).

Table 1. CAGE Questionnaire

CAGE Questionnaire (In the last 12 months)
Have you ever felt you should Cut down on your drinking?
Have people Annoyed you by criticizing your drinking?
Have you ever felt bad or Guilty about your drinking?
Have you ever had a drink first thing in the morning to "steady your nerves" or get rid of a hangover (Eye Opener)?

JA Ewing "Detecting Alcoholism: The CAGE Questionnaire" *JAMA* 252: 1905-1907, 1984.

The Alcohol Use Disorders Identification Test: Interview Version

Read questions as written. Record answers carefully. Begin the AUDIT by saying "Now I am going to ask you some questions about your use of alcoholic beverages during this past year." Explain what is meant by "alcoholic beverages" by using local examples of beer, wine, vodka, etc. Code answers in terms of "standard drinks". Place the correct answer number in the box at the right.

1. How often do you have a drinking obtaining alcohol?
(0) Never [Skip to Qs 9-10]
(1) Monthly or less
(2) 2 to 4 times a month
(3) 2 to 3 times a week
(4) 4 or more times a week

2. How many drinks containing alcohol do you have on a typical day when you are drinking?
(0) 1 or 2
(1) 3 or 6
(2) 5 or 6
(3) 7, 8, or 9
(4) 10 or more

3. How often do you have six or more drinks on one occasion?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

4. How often during the last year have you found that you were not able to stop drinking once you had started?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

5. How often during the last year have you failed to do what was normally expected from you because of drinking?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

7. How often during the last year have you had a feeling of guilt or remorse after drinking?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

8. How often during the last year have you been unable to remember what happened the night before because you had been drinking?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

9. Have you or someone else been injured as a result of your drinking?
(0) No
(2) Yes, but not in the last year
(4) Yes, during the last year

10. Has a relative or friend or a doctor or another health worker been concerned about your drinking or suggested you cut down?
(0) No
(2) Yes, but not in the last year
(4) Yes, during the last year

Record total of specific items here

If total is greater than recommended cut-off, consult User's Manual.

Figure 1. Alcohol Use Disorders Identification Test

Used with permission, World Health Organization, Department of Mental Health and Substance Dependence, The Alcohol Use Disorders Identification Test, Guidelines for Use in Primary Care, Second Edition 2001, page 17

The CAGE questionnaire (four questions) is the simpler of the two survey tools. However, the limited focus of CAGE identifies only alcohol-dependent subjects who likely need intervention beyond the scope of what can be provided during an ED visit. In contrast, the AUDIT is a 10-question survey used by the World Health Organization that identifies a subject "at risk" for harmful and hazardous events. The AUDIT surveys three key domains (hazardous use, dependence symptoms, and harmful use), which yield a more complete profile of a person with an alcohol-use disorder. More importantly, AUDIT identifies the individuals "at risk" for alcohol-use problems who may benefit the most from SBIRT.

Identification of "at risk" drinkers is only one part of the SBIRT method. The intervention component of SBIRT is accomplished through a motivational interviewing technique better known as the brief negotiated interview (BNI). Utilizing the BNI, introspective discussion and questioning of a patient leads to an eventual assessment of their willingness to modify their alcohol consumption toward healthier limits (Figure 2 and 3). Finally, upon completion of the BNI, the patient's new alcohol-use reduction goals and outpatient treatment and follow-up plans are reviewed.

Why SBIRT in the ED?

Emergency departments remain the healthcare safety net for the nation. By default, millions of individuals seek "primary care" in the ED. SBIRT has the potential to reach this vulnerable yet neglected population to identify drinking patterns and habits that put them at significant risk for alcohol-related illness and serious injury. Further, studies repeatedly find that a substantial proportion of ED patients have significant underlying alcohol problems.[14-16] As a result, millions more will be caught in the cycle of recidivism for alcohol-related disease and trauma.[17, 18]

According to the American College of Surgeons Committee on Trauma (ACS-COT), as of 2006 all Level I and Level II trauma centers must be SBIRT-capable and integrate it into their trauma service repertoire. Without this service, trauma centers place their verification status in jeopardy. While the ACS-COT makes the requirement for SBIRT clear for Level I and II trauma centers in its publication, *Resources for Optimal Care of the Injured Patient: 2006*, it also recommends that all trauma centers utilize SBIRT as part of routine trauma care.[19] The ACS-COT, in collaboration with the Center for Disease Control and Prevention, National Highway Traffic Safety Administration, and the Substance Abuse and Mental Health Service Administration, is holding national SBIRT training sessions for trauma care providers throughout the United States for the 2007 year.[20] Finally, and most importantly, studies show that patients are amenable to participating in SBIRT[21] and that SBIRT is efficacious in patients with alcohol-use problems.[12, 22-29] In a review conducted by D'Onofrio and Degutis, positive effects of SBIRT were found in 32 of 39 clinical studies.[24] SBIRT studies in EDs and trauma

Figure 2. Users at Risk

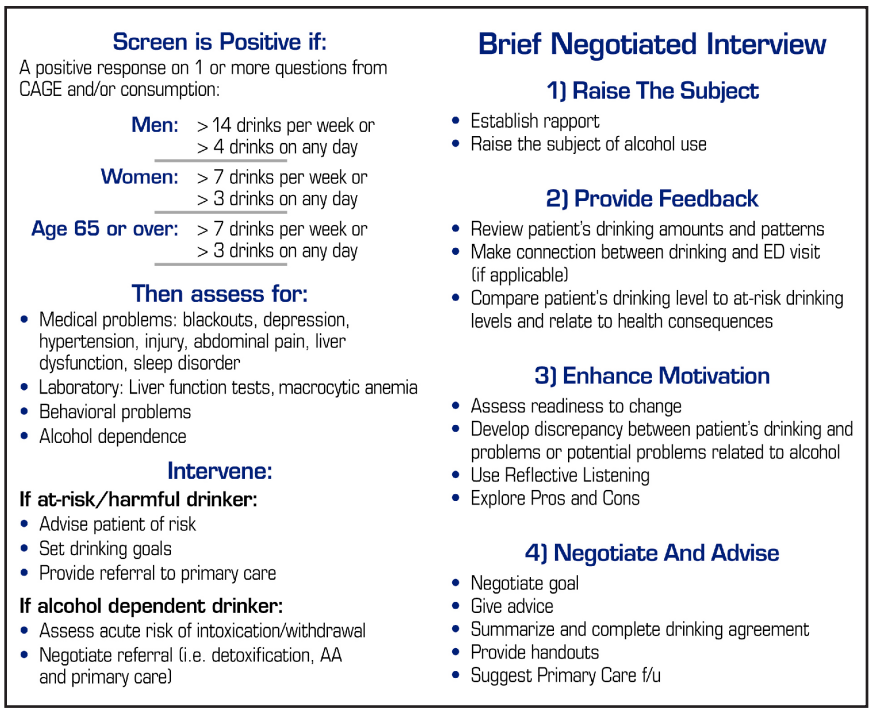

Figure 3. Negotiated Interview

centers have reported reduction in alcohol consumption and repeat-injury hospitalizations as well as decreased drinking and driving.[12, 14, 23, 26, 30]

Models of SBIRT Administration

The most common models used to administer SBRIT to ED patients are emergency physician (EP)/nurse- directed SBIRT or administration through the use of specially trained health promotion/education paraprofessionals. These models are not without their limitations.

In busier EDs, it may be infeasible to have only emergency physicians or nurses administer SBIRT. While time constraints in some ED settings are challenging, this should not completely preclude the integration of SBIRT into the ED. If resources allow, specially trained paraprofessionals can administer SBIRT. The added value of these personnel can positively impact both customer satisfaction as well as health promotion activities.[31] Another method for SBIRT administration in a busy ED setting is that of using computer technology and human-computer interaction to accomplish SBIRT tasks and goals. The use of computers in the ED for SBIRT and other health promotion activities has been feasible and holds considerable promise.[32-34] While several variations in the method of computer use for SBIRT do exist, they all focus on minimizing the physician time to administer SBIRT; they also facilitate standardization and fidelity of SBIRT delivery. Further, through relatively simple computer programming and the use of software, computers offer greater facilitation of multi-lingual administration with little added additional effort or cost.

In our institution we have been successful in integrating a bilingual (English and Spanish) "roll-to-the-bedside" Computerized Alcohol Screening and Intervention (CASI) kiosk prototype. We have found the average patient screening time with CASI to be less than five minutes. This kiosk is fully interactive through an audio and graphical interface. Through a touch-screen monitor and head phones, CASI engages the patient in conversation, administers the AUDIT questionnaire, undertakes a brief negotiated interview, and prints a personal alcohol-reduction plan with referral to treatment information. While the integration of a human-computer interaction model for SBIRT administration is feasible, more rigorous studies using computerized SBIRT are needed to more completely assess its efficacy. Such efforts continue to be encouraged by federal research funding agencies.[35]

Challenges to SBIRT Integration

The availability of time to administer SBIRT in the ED is arguably the most significant challenge. However, innovative approaches to SBIRT delivery have helped to overcome this barrier in some EDs. Further, it should be noted that the majority of ED patients who will encounter SBIRT will either be non-drinkers or drinkers found not to be at risk. This essentially removes 70–75% of those screened from the brief negotiated interview. For subjects identified by SBIRT as "at risk drinkers" who undergo both the screening and brief negotiated interview, the aggregate time remains an average of 10 minutes. Further, with computerized SBIRT

the screening and brief intervention delivery is routinely less than 10 minutes for the "at risk" drinker. While for some the time expense to SBIRT may still be considered too much of a "cost," one only need compare the amount of time and vigor spent to screen patients for tetanus even though the average number of new tetanus cases per year in the U.S. is only 43.[36] Contrast that to the number of annual alcohol-related crash fatalities of nearly 17,000, with nearly 8 million alcohol-attributable ED visits every year.

Another challenge to SBIRT in the ED is the comfort level at which EPs and nurses can administer SBIRT to patients. Some training and learning must take place before the person-to-person SBIRT interaction becomes efficient and routine. Even though most acute care providers may be comfortable asking a patient if they drink alcohol, a more in-depth discussion about alcohol-use patterns takes practice, particularly as the healthcare professional conducts the brief negotiated interview and motivates the patient to consider healthier and safer alcohol use. In general, the skills to become effective in delivering SBIRT in the ED are relatively easy to acquire. Some helpful online resources can be found on internet web pages hosted by the American College of Emergency Physicians (http://www.acep.org/webportal/PracticeResources/issues/pubhlth/alcscreen), the Substance Abuse and Mental Health Administration (http://sbirt.samhsa.gov/ and http://sbirt.samhsa.gov/documents/SBIRT_guide_Sep07.pdf) and the National Institute for Alcohol Abuse and Alcoholism (http://www.niaaa.nih.gov/Publications/EducationTrainingMaterials/guide.htm). While physicians and nurses can become proficient at administering SBIRT, it should be noted that the available resources and services for in-patient and long-term treatment for dependent drinkers remain under-funded and limited in most communities.

A final challenge to consider comes from a policy perspective in the form of *The Uniform Accident and Sickness Policy Provision Law*, or UPPL. In 1950, the National Association of Insurance Commissioners developed the provision that allows insurance carriers to exclude coverage to patients for alcohol- and drug-related injuries. As a result, physicians and hospital staff have the false perception that reimbursement for their services will universally be denied. This perception is counterproductive to helping patients who might otherwise benefit from SBIRT. There continues to be growing legislative activity throughout the nation with recent repeals of UPPL in some states. Furthermore, studies show significant legislative support for wider repeal of UPPLs nationwide.[37, 38]

Promising Facilitators of SBIRT

Several recent developments have begun to further facilitate and support ED SBIRT efforts. In addition to the ACS-COT mandate, according to George Washington University Medical Center's research group, Ensuring Solutions to Alcohol Problems, the 2007 federal legislative year may be the busiest yet in repealing UPPL or Alcohol Exclusion Laws. Moreover, as of January 2007, current procedural terminology codes (CPT) have been approved to allow the U.S. Center for Medicare and Medicaid Services to reimburse for alcohol and drug screening and brief intervention.[38] While there are many more details to work out in billing and reimbursement for SBIRT, there is potential for a regular revenue stream to counter the argument that ED personnel are too busy to perform this critical public health intervention.

CONCLUSION

Although the initial "cost" of implementing SBIRT in the ED may appear to be an additional burden, the savings are great and include less recidivism and avoidance of alcohol-related medical illness, injury and fatality. Alcohol SBIRT offers advantages to patient care, patient well-being and the public's health.

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Recovery from Severe Hyperthermia (45°C) and Rhabdomyolysis Induced by Methamphetamine Body-Stuffing

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INTRODUCTION

The acute toxic effects of sympathomimetic stimulant drugs include hypertensive crisis, coronary and cerebral vasospasm, cardiac dysrthythmias, seizures, hyperthermia, rhabdomyolysis, and metabolic derangements such as hyperglycemia, metabolic acidosis, and either hyper- or hypokalemia.[1] This report presents a case of complete recovery from severe hyperthermia with a temperature at 45°C (113°F) and rhabdomyolysis resulting from methamphetamine body-stuffing and physical exertion. The patient's initial recorded core body temperature is the highest ever reported in a case with laboratory-confirmed sympathomimetic drug overdose.

CASE REPORT

A 23-year-old man was a restrained driver involved in a minor motor vehicle collision with a police cruiser, and suffered no apparent injuries. Fearing that he would be arrested for possession of illicit drugs, the driver ingested what he later estimated to be 100 dose-units of methamphetamine (≥1 gram) he had been selling. He then fled the scene on foot. A chase ensued, and he was apprehended by police while running around the roof of one building and attempting to jump to another roof. The ambient temperature at that time was approximately 22°C (75°F), with a relative humidity of 39%, giving a heat index of 25°C (77°F). The police placed restraints on their suspect's lower extremities and then summoned paramedic-level emergency medical technicians (EMTs) to transport him for medical evaluation.

Upon their arrival, EMTs found the patient combative and screaming with a repetitive speech pattern. Vital signs in the field were: pulse at ~200/min (sinus tachycardia on cardiac monitor), respirations at 40/min (rapid and shallow), and an oxygen saturation of 98% on ambient air. Blood pressure could not be recorded due to the patient's agitation, and body temperature was not measured. Physical examination by the EMTs was notable for warm, diaphoretic skin, mydriasis, and some dried blood around the lips, but no other gross signs of trauma. Intravenous (IV) access could not be established due to the patient's agitation, and he was transported within 4 minutes to the nearest hospital emergency department (ED).

Upon arrival to the ED the patient was agitated, combative, and both physically and verbally threatening to the staff. He was placed in four-point leather restraints and rapidly evaluated. Vital signs were: pulse at 164/min, respirations at 30/min, blood pressure at 152/70 mmHg, and temperature at 43.6°C (110.4°F) orally. Only one oral temperature measurement was made before resuscitative measures began. IV access was established and hydration initiated with 0.9% saline in one-liter boluses. To control the patient's extreme agitation and facilitate treatment, he was endotracheally intubated with rapid sequence induction using 10 mg IV lorazepam and 10 mg IV vecuronium. A core body temperature was then measured at 45.0°C (113°F) with a rectal probe thermometer, which was used intermittently during the ED course. Additional cooling measures employed were the application of ice packs to the groin and axillae and a cooling blanket. A Foley catheter was inserted, with return of ~200cc dark, red urine. Physical examination revealed skin abrasions to the lower right anterior chest wall, bilateral knees and knuckles, apparently sustained during the chase, but no other evidence of trauma. An electrocardiogram revealed a wide-complex sinus tachycardia at a rate of 162/min with a QRS duration of 122 msec.

Initial laboratory results were: arterial pH at 7.38, pCO_2 at 31.0 mmHg, pO_2 at 551 mmHg, serum creatinine phosphokinase (CPK) at 2083 IU/L, CPK-MB at 10.9 IU/L, white blood cell count at 11.1 k/mm^3, hematocrit at 41.4%, and platelet count at 274 k/mm^3. Computed tomography of the head was within normal limits. Urine drug screening by enzyme-multiplied immunoassay technique (EMIT) was positive for amphetamines and cannabinoids only.

One hundred minutes after ED arrival, the patient's core temperature had decreased to 38.1°C (100.6°F). He was given a total of 6300cc IV fluids prior to transfer via helicopter to the regional toxicology referral center; urine output in this time was 1800cc over three hours.

The patient arrived in the intensive care unit (ICU) 3.5 hrs after initiation of treatment. Vital signs on ICU arrival were: temperature at 36.4°C (97.6°F), pulse at 128/min, and blood pressure at144/56 mmHg. Laboratory investigation showed: hematocrit at 37.9%, platelet count at 105 k/mm^3, prothrombin time at 14.3 sec, fibrinogen at 258 mg/dL, fibrin split products at <5 mg/dL, sodium at 141 mEq/L, potassium at 3.8 mEq/L, chloride at 109 mEq/L, bicarbonate at 21 mEq/L, blood urea nitrogen (BUN) at 17 mg/dL, creatinine at 1.1 mg/dL, glucose at 112 mg/dL, calcium at 5.5 mEq/L, magnesium at 2.3 mEq/L, phosphate at 2.2 mEq/L, CPK at 12,173 IU/L, CPK-MB at 110 IU/L, with no detectable acetaminophen, salicylate, or ethanol. Comprehensive urine drug screening by EMIT, thin-layer chromatography (TLC), and gas chromatography-mass spectroscopy (GC-MS) confirmed the presence of methamphetamine, amphetamine, caffeine, and cannabinoids only. No cocaine or benzoylecgonine (the primary cocaine metabolite) were detected.

The patient was treated with supplemental IV calcium, and was given activated charcoal via nasogastric tube. Aggressive IV hydration with bicarbonate-containing fluids (D5W with 150 mEq $NaHCO_3$ and 40 mEq KCl per liter infused at 250 cc/hr) to alkalinize the urine was continued. Including the initial boluses with normal saline, the patient received 9200cc total IV fluids within the first 12 hours of treatment. A urinalysis performed 11 hours after ED arrival showed: pH at 9.0, specific gravity at 1.015, 3+ protein, 3+ blood, and 20-30 red blood cells/hpf.

The patient remained comatose for 26 hours after intubation, but was successfully extubated on the second hospital day. The patient exhibited tachycardia, agitation, confusion, picking movements of the hands, and paranoid delusional thinking which slowly resolved over the following two days. Serial laboratory measurements showed a rapid rise in serum CPK, peaking at 119,901 IU/L on the third hospital day. The patient's peak serum creatinine was 1.1 mg/dL (at the time of ICU admission), and the BUN peaked at 18 mg/dL a few hours later. The patient never developed clinical evidence for a compartment syndrome as the basis for his notable rhabdomyolysis, nor did he experience a drop in urine output. The patient was discharged home on hospital day 5, with serum CPK at 39,006 IU/L, BUN at 6 mg/dL, and creatinine at 0.7 mg/dL. The patient and his wife agreed that his mental status had returned to baseline, with no detectable neurologic deficits. The patient was advised to return immediately for decreased urinary output, weakness, or other problems.

DISCUSSION

Hyperthermia is well recognized as a cause of major morbidity and mortality.[2] Hyperthermia may be caused by environmental exposure, infection, central thermic dysregulation, and/or by ingestion of various drugs. During the period from 1999-2003, the Centers for Disease Control and Prevention reported 3,442 heat-related deaths in the United States, 2,239 of which were due to exposure to excessive environmental heat, but without documentation of hyperthermia in the victims. Of the remaining 1,203 deaths associated with hyperthermia, 345 (29%) were associated with "external causes (e.g., unintentional poisonings)".[3] The exact pathophysiologic cause of death from hyperthermia is not known, but is probably multifactorial. Autopsy results have shown tissue injury to the myocardium, kidneys, central nervous system, liver, and skeletal muscle. Tissue injury is often worse in cases of exertional heatstroke, compared to "classic" heatstroke due to excessive environmental exposure.[4]

In their review of 250 cases of drug-related heatstroke, Clark and Lipton found that nearly half of the patients had a maximal recorded body temperature of 40-41°C and their survival rate was 69%.[5] About one-quarter had a temperature of 41.1-42.1°C, with 53% survival; the remaining victims with temperatures >42.1°C had a survival rate of only 30%.[5] The highest reported core body temperature in a patient who survived without permanent residual deficits was 46.5°C (115.7°F).[6] This 52-year-old patient suffered from environmental heatstroke, possibly exacerbated by ethanol consumption. In fact, this patient's peak temperature was likely higher, as an accurate measurement was not made until 25 minutes after initiating active cooling measures.

A case of even more extreme hyperthermia from sympathomimetic drug use has been reported, but lacked positive laboratory test results to confirm the drug exposure. Roberts et al[7] reported the case of a patient with a rectal temperature of 45.6°C (114°F) after IV injection of a substance thought to be cocaine; however, no cocaine or amphetamines were detected in either blood or urine.

The extreme hyperthermia (45°C; 113°F) seen in the patient presented here, therefore, represents the highest reported core body temperature in a case with laboratory confirmation of psychostimulant drug exposure. Both the EMIT and GC-MS methodologies confirmed the presence of amphetamines and the absence of cocaine. The number of compounds that could be detected by GC-MS in the referral center's laboratory exceeded 1500, and included most anticholinergic drugs (such as atropine, scopolamine, diphenhydramine, benztropine, cyclic antidepressants, and antipsychotics) which might produce a similar clinical picture in overdose. These drug detection tests are qualitative, not quantitative, so they only prove drug exposure but not overdose. Serum

levels of methamphetamine and/or amphetamine would have been the most ideal laboratory confirmation of acute overdose, but these were not obtained during the period of the patient's acute, severe intoxication. Nevertheless, the patient's history and clinical course were consistent with acute, severe sympathomimetic toxicity.

Drug-related and combination drug/environmental heatstroke victims commonly develop multisystem organ failure, characterized by rhabdomyolysis, acute renal failure, and disseminated intravascular coagulation (DIC). The patient presented here never developed renal failure or DIC, despite extreme hyperthermia and severe rhabdomyolysis. Factors that may have affected outcome in this case include aggressive initial IV hydration, the relatively short duration of extreme hyperthermia, rapid employment of multiple cooling measures (including neuromuscular blockade), the patient's baseline good health, and other supportive care measures. Drug-related heatstroke patients may require unusually vigorous initial IV hydration to correct intravascular volume depletion and to ensure adequate renal blood flow and urine output, guarding against heme pigment-induced nephropathy.

CONCLUSION

Severe hyperthermia may occur from the combination of physical exertion and methamphetamine body-stuffing. Aggressive cooling measures, intravenous hydration, and urinary alkalinization resulted in complete recovery, despite rhabdomyolysis and prolonged sympathomimetic toxicity.

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Images in Emergency Medicine : CSF Hydrothorax

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A 30-year-old African-American female presented to the Emergency Department with a complaint of a cough for two months. The patient had a history of developmental delay, seizure disorder and ventriculo-peritoneal (VP) shunt. Physical exam was significant for a blood pressure at 101/71 mm Hg, heart rate at 111 beats per minute, respiratory rate at 18 breaths per minute and temperature of 98° F. She was a well-developed female in no apparent distress with a shunt palpable on the left side of the skull and a normal lung exam, except for slightly decreased breath sounds in the left base. During her workup, a chest x-ray demonstrated a large left-sided pleural effusion (Figure 1). The patient received a thoracentesis and the fluid was initially thought to be a transudate.

Subsequent CT scan of the chest revealed the tip of the VP shunt in the left chest adjacent to the aorta resulting in a CSF hydrothorax (Figure 2). Thoracic migration of peritoneal catheters causing hydrothorax is a rare complication of VP shunts.[1] In some cases the migration of the catheter results in malfunction and neurologic findings, which was not the case in our patient.[2]

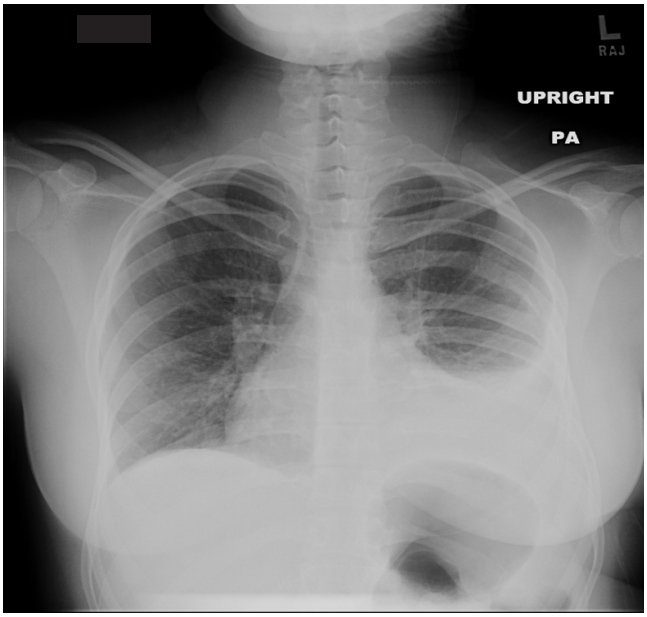

Figure 1. Chest x-ray demonstrating a left-sided pleural effusion.

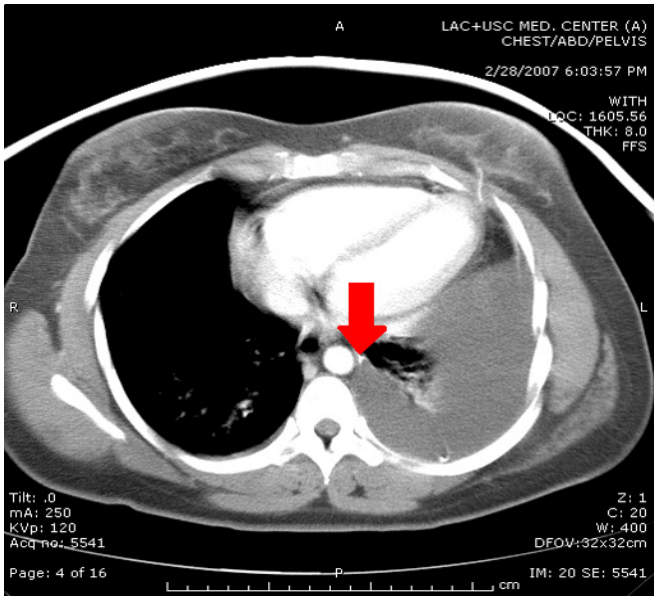

Figure 2. Computed tomography chest demonstrating the tip of the ventriculo-peritoneal shunt catheter adjacent to the aorta.

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New Onset Thyrotoxicosis Presenting as Vomiting, Abdominal Pain and Transaminitis in the Emergency Department

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This case report describes an unusual presentation of an emergency department (ED) patient with nausea, vomiting, and epigastric pain, who was initially suspected of having viral hepatitis. The patient returned to the ED seven days later with persistent tachycardia and was diagnosed with new onset thyrotoxicosis.
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INTRODUCTION

Thyrotoxicosis is an uncommon diagnosis in the emergency department (ED). Vomiting and abdominal pain are uncommon symptoms of thyrotoxicosis, and when coupled with laboratory abnormalities such as transaminitis, the emergency physician (EP) can be misled to a diagnosis of hepatitis.[1] With thyrotoxicosis, many cellular metabolic processes are affected by excess thyroid hormone production, resulting in tachycardia, heat intolerance, palpitations, sweating, fatigue and tremulousness.[1] Since thyrotoxicosis can progress to the life-threatening thyroid storm if untreated, early diagnosis with thyroid function tests and early intervention with beta blockers and agents to reduce thyroid hormone production and release are necessary. We present the case of a patient with vomiting, dehydration, and abdominal pain, which nearly resulted in exploratory laparoscopy, and in whom thyroid function tests showed new onset thyrotoxicosis.

CASE REPORT

A 28-year-old female physician presented to the ED with nausea and vomiting for three days with epigastric pain and decreased urination. The vomiting was non-bloody and non-bilious, occurred four times per day, and the patient was unable to tolerate liquids. The epigastric pain was mild, constant, and sharp. The patient felt a rapid pulse. She denied fever, chills, diarrhea, melena, or prior similar episodes. The past medical history was unremarkable with no prior surgeries, medical problems, or medications. The family history was documented as noncontributory and the patient denied pregnancy and alcohol, tobacco or drug use.

The physical exam revealed an oral temperature of 36.7º C, heart rate at 131 beats/min, respirations at 18 breaths/min, blood pressure at 128/75 mm Hg, and room air oxygen saturation (O_2 sat) at 100%. The patient weighed 52.3 kg with a height of 157.5cm. She was alert and oriented, nontoxic and in no distress. The eye exam was normal without exophthalmos. There was no lymphadenopathy, no goiter was noted, and a thyroid exam was not documented. The lungs were clear and the cardiac exam was normal other than tachycardia. The abdomen was soft with normal bowel sounds, with mild tenderness in the epigastrium but no rebound or guarding. The neurological exam revealed normal cranial nerve function, full strength and sensation, and a normal gait. Deep tendon reflexes were not documented.

A metabolic panel including electrolytes, glucose, BUN and creatinine were normal. Liver function tests showed albumin at 3.6 g/dL(normal 3.2-5.5), AST at 118 IU/L(normal 8-40), ALT at 197 IU/L(normal 0-60), alkaline phosphatase at 51 IU/L(normal 26-110), and total bilirubin at 1.5 mg/dL(normal 0-1.4). The lipase level and complete blood count with differential were normal. A voided urinalysis showed specific gravity of 1.024, pH at 7.30, ketones at 150 mg/dL, small bilirubin, urobilinogen at 8 mg/dL, 2 red blood cells/high power field (hpf), 3 white blood cells/hpf, 6 epithelial

cells/hpf, moderate bacteria, and no hemoglobin, leukocyte esterase, nitrite, protein, glucose, or crystals. A urine pregnancy test was negative. Bedside ED ultrasound by the EP showed no evidence of cholecystitis.

The patient received two liters IV normal saline and two doses of antiemetics. She then tolerated an oral liquid challenge, felt better and requested to be sent home. The discharge diagnosis was possible gastritis versus viral hepatitis. Lansoprazole 15 mg once daily was prescribed, with primary care physician (PCP) follow up in 1-2 days. A repeat set of vital signs was not documented.

Seven days later, the patient returned. She had seen her PCP who referred her for an esophagogastroduodenoscopy (EGD). She had not eaten or drunk for 20 hours prior to the procedure. The EGD, done with fentanyl and midazolam sedation, found a small hiatal hernia with no other abnormalities. Because of persistent tachycardia in the 140s/minute with intractable vomiting, the patient was sent directly to the ED. The patient stated the vomiting had resolved since the last ED visit and only started again after the EGD. The epigastric pain persisted without change and the only additional complaint was tremulousness. She continued to deny fever, chills, diarrhea, and melena.

The physical exam showed an oral temperature of 36.3º C, heart rate at 143 beats/min, respirations at 20 breaths/min, blood pressure at 125/61 mm Hg and O_2 sat at 100% on 2L/min oxygen per nasal cannula. The patient weighed 50 kg (a 2.3 kg weight loss in one week). The patient was alert, tremulous and appeared fatigued. The remainder of the exam was unchanged. She received supplemental oxygen, three liters IV normal saline, and cardiac monitoring.
A repeat complete metabolic panel showed normal glucose and electrolytes except for bicarbonate at 19 mEq/L(normal 25-34), magnesium at 1.8 mg/dL(normal 1.8 – 2.5), albumin at 3.2 g/dL, AST at 83 IU/L, ALT at 87 IU/L, alkaline phosphatase at 48 IU/L, and total bilirubin at 0.8 mg/dL. A serum lipase level and complete blood count with differential were within normal limits. The erythrocyte sedimentation rate and C-reactive protein were normal. A urinalysis was not repeated. An EKG showed a narrow-complex sinus tachycardia at a rate of 152 beats/min with no ischemic ST or T wave changes. In addition, she had thyroid function tests sent, which are performed once daily by our institution's laboratory. The patient tolerated oral liquids after antiemetics. Despite hydration, the patient's tachycardia persisted at 130 beats/min. She appeared fatigued but had resolution of all other presenting symptoms. The patient was admitted to the internal medicine service on a telemetry floor.

Overnight she received two more liters IV normal saline, followed by maintenance rate. A right upper quadrant ultrasound showed a markedly thickened gallbladder wall without gallstones, a small amount of pericholecystic fluid, and a normal common bile duct. Radiology recommended a CT scan of the abdomen and pelvis, which showed small bilateral pleural effusions, periportal edema, upper abdominal ascites, marked gallbladder wall thickening, and moderate amount of free fluid in pelvis.

The next day general surgery recommended an exploratory laparoscopy. This procedure was delayed because the patient ate breakfast. The first two thyroid function panels sent from the ED and on hospital day two were invalid due to hemolysis, but a third set showed a free thyroxine (T4) level greater than 6 ng/dL(normal 0.8-1.9) and an undetectable thyroid-stimulating hormone (normal 0.5-5 mIU/L). After atenolol and methimazole, the patient improved and was discharged on the third hospital day with diagnoses of new onset thyrotoxicosis, dehydration, liver hemangioma, and small hiatal hernia.

DISCUSSION

Nausea, vomiting and abdominal pain are common complaints in the ED. However, they are uncommon signs of thyrotoxicosis.[1] Thyrotoxicosis is uncommon itself, with a lifetime prevalence of 0.5% and an annual incidence of 30 cases per 100,000 persons per year. It occurs in a male-to-female ratio of 1:5-10.[2] In British studies, the incidence is reported as high as 100-200 cases per 100,000 population per year.[3,4] Although uncommon, it is important to detect thyrotoxicosis early due to the risk of life-threatening thyroid storm, which carries a mortality of 20-50% if untreated.[5]

Patients with thyrotoxicosis typically present in a hypermetabolic state with sympathetic activation. The symptoms include anxiety or nervousness, psychosis, weight loss, excessive hunger, hyperdefecation, menstrual irregularities, pretibial edema, fever, heat intolerance, hyperhidrosis, goiter, ophthalmopathy (thyrotoxic stare/lid retraction), hyperreflexia, palpitations, tachycardia, hypertension, heart failure, and atrial fibrillation.[6,7,8,9] A list of signs and symptoms in descending order of frequency is shown in Table 1. Our patient presented only with tachycardia, vomiting, and abdominal pain during her first visit, the latter two signs being uncommon in thyrotoxicosis. However, thyrotoxicosis has infrequently been associated with gastroparesis, resulting in abdominal pain and nausea. It was not until her return visit that she was noted to be tremulous.[10]

Like our patient, women in their third through sixth decade of life are at highest risk for thyrotoxicosis.[6] Although our patient was not pregnant, excess exposure to thyroid hormone *in utero* is associated with high spontaneous abortion rates of up to 22%.[11]

Other rarely reported presentations of thyrotoxicosis include diabetic ketoacidosis in a previously well-controlled diabetic, near-fatal cardiac arrhythmias, and hypokalemic periodic

paralysis.[12,13] In addition, a previous case report discussed multi-organ dysfunction characterized by lactic acidosis and liver failure.[14] Our patient did have an acidosis (bicarbonate 19 mEq/L) and although not in frank liver failure, did have elevated transaminases.

Since rapid thyroid function testing is unavailable in most EDs, the diagnosis of thyrotoxicosis is largely clinical. Persistent tachycardia, diffuse goiter, and hyperreflexia should sway the emergency physician to strongly consider thyrotoxicosis. Elevated levels of thyroxine (T4) and triiodothyronine (T3) with depressed thyroid-stimulating hormone (TSH) are diagnostic.[6] Modest elevations in glucose (30-55% of patients), calcium (10% of patients), bilirubin, and transaminases (rare) may be

Table 1. Clinical Findings in Thyrotoxicosis.

Clinical Manifestations	Percent	Clinical Manifestations	Percent
Tachycardia	100	Weakness	70
Goiter	98	Increased appetite	65
Nervousness	99	Eye complaints	54
Skin changes	97	Leg swelling	35
Tremor	97	Hyperdefacation	33
Sweating	91	Diarrhea	23
Hypersensitivity to heat	89	Atrial fibrillation	10
Palpitations	89	Splenomegaly	10
Fatigue	88	Gynecomastia	10
Weight loss	85	Anorexia	9
Bruit over thyroid	77	Liver palms	8
Dyspnea	75	Constipation	4
Eye Signs	71	Weight Gain	2

Williams RH. *J Clin Endocrinol Metab* 1946:6:1.

seen, as well as a mild normochromic normocytic anemia.[6] Our patient had evidence of dehydration on her urinalysis (specific gravity of 1.024) and chemistry panel (BUN/creatinine ratio greater than 20), but repeat vital signs during her initial visit were not documented to see if hydration had resolved her tachycardia. In addition, a family history was not documented which would have suggested the diagnosis in the ED, since it was later found that her mother had Graves' disease.

The most common causes of thyrotoxicosis include diseases of primary hyperthyroidism with Graves' disease as the most common cause (60-70%). This was our patient's ultimate diagnosis by her endocrinologist. Other causes of primary hyperthyroidism include toxic multinodular goiter (15-30%) and iodine intake (rare). Thyroiditis (painful subacute, silent subacute, postpartum, radiation induced; 20%), central hyperthyroidism (pituitary adenoma; 3-5%), and nonthyroid diseases (ectopic thyroid tissue from stroma ovarii, metastatic thyroid cancer; rare) can also cause thyrotoxicosis. Drug ingestions and medication side effects precipitating thyrotoxicosis are rare.[5]

Drug-induced hyperthyroidism is linked to dietary supplements, especially metabolic boosters containing T3 or its derivatives, iodine-containing medications including indinovir and cough medications, and intentional or unintentional overingestion of levothyroxine. Iodine should also be avoided during imaging studies as this can worsen thyrotoxicosis. Our patient had a CT scan with iodine contrast without documented effects. However, the thyroid uptake scan could not be interpreted due to the use of iodine. Another series reported an epidemic of thyrotoxicosis, ultimately attributed to beef products contaminated with bovine thyroid hormone.[16] Perhaps one of the most notorious medications associated with thyroid dysfunction is amiodarone. In a case study published in 2005, more than 27% of cardiac patients started on amiodarone had thyroid dysfunction; 7% were thyrotoxic.[15]

Management of a patient with thyrotoxicosis depends on the clinical presentation. Mild hyperthyroidism may be managed with judicious outpatient care, whereas moderate to severe thyrotoxicosis or thyroid storm requires emergent treatment. Initial therapy consists of stabilization: airway protection, oxygenation, intravenous fluids and cardiorespiratory monitoring.[5] Fever should be managed with acetaminophen and cooling techniques. Dehydration should be addressed with appropriate fluid replacement. Ultimately, anti-thyroid medications and beta-blockers should be started while precipitating factors such as infection, trauma, cerebrovascular accident, myocardial infarction, general surgery, and medication reactions identified and managed accordingly.[5]

Following stabilization, the treatment goal is to inhibit hormone synthesis and release, prevent conversion of T4 to T3, and block hormone action in the periphery.[6] Inhibition of synthesis is accomplished by thioamides [propylthiouracil (PTU), methimazole] which block thyroid peroxidase. PTU is preferred as it blocks peripheral conversion of T4 to T3.

Lithium and iodine both inhibit hormone release. However, lithium is difficult to titrate, and, therefore, iodine is preferred.[5] In order to prevent iodine organification (Wolff-Chaikoff effect), thioamides should be given at least one hour before iodine therapy.[5] Peripheral conversion, accounting for 85% of circulating T3, is impeded by PTU, propranolol, and dexamethasone.[6] The sympathomimetic effects of thyroid hormone are also managed with propranolol, which can reduce dysrhythmias, fever, tremors,

palpitations, and anxiety.[6] If clinical deterioration occurs in spite of appropriate therapy, thyroid hormone may be removed via exchange transfusion, plasmapheresis, or charcoal plasmaperfusion, the latter being cited in textbooks but rarely done in clinical practice.[6] Our patient was ultimately treated with methimazole and atenolol and showed clinical improvement prior to discharge.

Although our case is an unusual presentation of an uncommon disease, it is prudent to focus on the learning points from the initial ED visit. Our patient presented with vomiting, tachycardia, and a urine analysis consistent with her initial diagnosis of dehydration. Hypovolemia-induced tachycardia should resolve after adequate fluid resuscitation.[17] During her second presentation, our patient was persistently tachycardic despite three liters of IV normal saline. Persistent tachycardia mandates a search for other causes including acute anemia, pulmonary embolism, arrhythmia, sepsis, toxic ingestions (sympathomimetic or anticholinergic agents), sedative/hypnotic withdrawal, hyperthyroidism, or other hyperadrenergic state. Further, a family history for autoimmune disorders suggests Graves' disease. Our patient was also found to have free fluid in her pelvis and a thickened gall bladder wall, almost resulting in laparoscopy. Since there are no reports of gallbladder wall thickening associated with thyrotoxicosis, this finding is best explained by overhydration, which is a known cause of ascites and gallbladder wall thickening.[18,19] Our patient received 5 liters IV normal saline within eight hours of her arrival and continued at a maintenance rate.

CONCLUSION

Thyrotoxicosis is an uncommon disease; however, its detection is important, as thyroid storm can develop if left untreated, carrying a mortality of 20-50%. Thyroid function testing is not available in most EDs. Therefore, diagnosis of thyrotoxicosis is largely clinical and relies on a thorough history and physical exam, including evaluation of family history. A repeat set of vital signs is necessary prior to discharging any patient, and a thorough evaluation for unexplained tachycardia is warranted. Thyrotoxicosis may present with abdominal pain and vomiting while other characteristic features are absent. The therapy for thyrotoxicosis consists of PTU, iodine and beta blockers. Moderate to severe thyrotoxicosis warrants admission to the hospital.

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Author Contributions: LG conceived and planned the project, and collected chart information. LG and DPB wrote parts of the manuscript. LG, SJS, JCF, and MIL edited the content and discussion. LG takes responsibility for the paper as a whole.

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1 Clinical Presentation of Patients Diagnosed Post-Operatively with Appendicitis at Private Hospitals in Southern Puerto Rico

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Objective: The goal of our study is to aid in early identification of appendicitis in Hispanics by retrospectively reviewing the initial presentation, physical examination, and laboratory values of patients diagnosed post-operatively with appendicitis.
Method: Data collected from medical records at private hospital emergency departments (EDs) in southern Puerto Rico between 1/1/2000 and 12/31/2005 in post-operative diagnoses of appendicitis included: 1) sex, 2) age, 3) chief complaint, 4) presence/absence of abdominal pain, fever, anorexia, nausea, vomiting, diarrhea, constipation and dysuria, 5) clinical findings of pain location, the presence/absence of guarding, rebound tenderness, psoas sign, 6) laboratory and radiological data, and 7) pathology findings. This data was compared with major reference textbooks using the chi squared test and α=0.05.
Results: Of 899 subjects this population was found to have significantly less anorexia (26.6%, p<.001), nausea (61.7%, p<.001), vomiting (50.9%, p<.001), and dysuria (4.6%, p<.001) than reported in major reference texts. There was a significantly greater frequency of fever (30.5%, p<.001), positive psoas sign (29.6%, p<.001) and leukocytosis (86%, p<.001).
Conclusion: The studied population varied greatly from commonly accepted literature frequencies for signs and symptoms of appendicitis. An important finding was a decreased frequency of anorexia. Anorexia, frequently considered a major symptom in appendicitis--classically indispensable in its clinical diagnosis--was found in only 26.6% of our sample. Most textbooks describe a frequency of anorexia from 70-100%. The differences found are of great significance for the future evaluation of Hispanic patients with suspected appendicitis. The presence of certain signs and symptoms should raise the suspicion of appendicitis in a patient with abdominal pain; however, their absence, especially anorexia, should not rule out appendicitis. This is especially true in the evaluation of the Hispanic population.

2 Teleradiology Over-read Retrospective Observational Study (TOROS)

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Background: Teleradiology is a system whereby attending-level, fully licensed radiologists interpret radiographic images over the internet, usually from a distant location and at night.
Objectives: To determine the frequency of disagreement on CT interpretations between teleradiologists and hospital-based radiologists; to determine which subtypes of CT studies most frequently have discordant interpretations; to determine if the difference in interpretation is clinically significant to Emergency Department management.
Methods: We performed a retrospective observational study

at a Northern California private hospital from January 1 to January 16, 2006. All consecutive CT scans performed between 5 pm and 8 am were reviewed; scans were eligible if they were interpreted primarily by a teleradiologist and subsequently by a staff radiologist.
Results: A total of 240 CT scans were reviewed, of which 207 were eligible. Overall discordance rate was 4.4% (95% Confidence Interval [CI], 2.3-12.4%); the overall clinically significant discordance rate was 3.9% (95% CI, 2.2-11.3%). Both the total and clinically significant discordance rates for CT abdomen/pelvis were 3.6% (95% CI, 2.6-12.6%); for CT chest were 5.3% (95% CI, 5.1-3.1%). The total discordance rate for CT head was 5.9% (95% CI, 4.3-20.3%), with a clinically significant discordance rate of 4.4% (95% CI, 3.5-16.8%).
Conclusion: The overall clinically significant discordance rate between teleradiologists and hospital-based radiologists on CT scan interpretation was higher than expected. The highest significant discordance rate was for CT chest, although the total numbers of scans and misses were small. The second highest significant discordance rate was for CT head, followed by CT abdomen/pelvis.

3 Experience and Training Are not Associated with the Ordering Propensity of Advanced Radiographic Imaging in the Emergency Department

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Objectives: The use of computed tomography (CT) and magnetic resonance (MR) imaging in the emergency department (ED) has increased over time. The purpose of this retrospective observational study was to explore the CT and MR ordering habits of a group of faculty emergency medicine (EM) physicians over a 15-month period of time at the University of California San Francisco.
Methods: Spreadsheets from Radiology containing information on every CT and MR scan ordered by EM physicians from June 2005 to August 2006 were obtained. This dataset included patient demographics, visit number, and study type. A second dataset was extracted from the electronic charting system used in the ED. The ordering physician for each scan was identified by matching visit numbers. Physicians that rarely worked and hand-offs between physicians were accounted for. The "ordering propensity" for each physician (number of imaging studies ordered per 100 patients seen) was thus calculated. Reliability of results was examined by looking at variability in six-month blocks. Acuity was determined by review of billing reports and admission rates. Physician characteristics were obtained from ED administrative records. Analysis of variance and regression were utilized to determine associations between variables.
Results: Twenty-two faculty physicians were evaluated. CT or MR imaging was ordered for approximately 20% of all patients seen during the study period by these physicians. The ordering propensity ranged from approximately 12% to 24% and was not explained by differences in patient acuity. Years since MD completion, residency training in EM, ABEM certification, gender, and work status were not associated with the ordering propensity of the individual physicians.
Conclusions: The CT and MR ordering propensity of a group of faculty EM physicians is variable and is not associated with experience and training in EM. There may be other variables not studied that are associated with ordering propensity.

4 Describing Cerebrospinal Fluid Red Blood Cell Counts in Patients with Subarachnoid Hemorrhage

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Objectives: It has been postulated that a decreasing red blood cell (RBC) count between the first and last tubes collected during lumbar puncture can be used to differentiate a traumatic tap from a true spontaneous subarachnoid hemorrhage (SAH). We sought to describe cerebrospinal fluid (CSF) RBC variation between tubes one and four in patients with known SAH.
Methods: We retrospectively identified all ED patients with a discharge diagnosis of SAH from June 1993 to November 2005. A structured chart review was performed on all patients with the additional billed procedure of "lumbar puncture," "lumbar drain," or "spinal tap." Data collected included: CSF RBC count in the first tube, CSF RBC count in the fourth tube, and an imaging study confirming the diagnosis. Patients were excluded if any of these three data points was absent.
Results: 1,323 patients seen in the ED were diagnosed with SAH, and 102 (7.7%) of these patients also had CSF collected. Of this group, 81 charts were located and reviewed. Thirty-five were then excluded for lack of documented RBC count in both tubes one and tube four, and 26 were excluded because of lack of documentation of an advanced imaging study. Of the remaining 20, seven (35%) were found to have an increase in RBC count between tubes one and four and 13 (65%) were found to have a decrease. Of the 13 patients who had an observed decrease in RBC counts between tubes, eight had a drop of >25%. The most dramatic case was a patient with xanthochromic CSF in whom the RBC count dropped from 453 in tube one to 0 in tube four.
Conclusion: In our sample of confirmed SAH cases, a drop in CSF RBC count was observed in 65% of cases, with a range spanning from 1% clearing to 100% clearing. These findings suggest that CSF RBC clearing between tube one and tube four is common in patients with SAH and thus cannot be used to rule out the diagnosis.

5 Emergency Department Series of Acute Conditions of the Scrotum

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Introduction: Acute scrotal pain comprises 0.5% of annual emergency department (ED) visits. Determining the etiology of acute scrotal pathology by history, exam and laboratory studies alone can be challenging. Radiology department-performed sonography (RDPS) is the imaging test of choice for scrotal pathology but may be time consuming and result in treatment delays and poorer outcomes. If accurate, ED-performed sonography (EDPS) may shorten time to diagnosis and treatment and result in quicker disposition and improved outcomes for scrotal pathology.
Methods: This retrospective cohort study evaluated the accuracy of EDPS for predicting the presence of scrotal pathology as established by RDPS. A composite endpoint consisting of testicular or testicular appendix torsion, epididymoorchitis, scrotal abscess or mass, varicocoele, spermatocoele, and epididymal cyst was used to define scrotal pathology. Subjects included a convenience sample of all patients presenting to our ED with acute atraumatic scrotal pain who received both EDPS and RDPS during a five-year period.
Results: During the study period 146 patients underwent EDPS, 49 of whom went on to receive RDPS. The sensitivity and specificity of EDPS for recognizing radiographic pathology as determined by RDPS were 0.93 (95% CI 0.81-0.98) and 0.33 (95% CI 0.02-0.87).
Conclusions: This study demonstrated relatively high sensitivity and low specificity for EDPS in predicting scrotal pathology. The low specificity in this study may have resulted from a selection bias affecting which patients underwent RDPS. These results indicate that all patients with abnormal EDPS should undergo RDPS. However, the low specificity of this study prevents conclusions regarding treatment of patients with negative EDPS. We conclude that EDPS is not currently accurate enough to recommend its use as a final diagnostic modality for patients presenting with a painful scrotum.

6 Availability of Standardized Chest Pain Order Sheet Improves Compliance with American College of Cardiology and American Heart Association Guidelines for the Treatment of Acute Coronary Syndromes

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Objective: The American College of Cardiology (ACC) and the American Heart Association (AHA) publish guidelines for the treatment of specific conditions within the spectrum of acute coronary syndromes (ACS). We hypothesized that, when available, implementation of a standardized chest pain order sheet for treatment of patients with ACS in our emergency department would improve adherence to the ACC/AHA guidelines.
Methods: This was an IRB-approved prospective observational study in an urban emergency department with 46,000 visits per year and an affiliated emergency medicine residency training program. The study involved three phases. During the first phase (3/04-9/04), charts of patients with the complaint of chest pain were reviewed for compliance with ACC/AHA guidelines. Two persons reviewed charts during a brief training session. To improve agreement between reviewers, five charts were reviewed in a trial run and again weekly. A third reviewer acted in cases of disagreement. In the second phase (9/04-12/04), a chest pain order sheet based on ACC/AHA guidelines was made available for physicians to use in evaluation and treatment of patients presenting with chest pain. The third phase (5/06-12/06) the chest pain order sheet was not available for physician use due to technical and logistical misadventures. In a similar fashion, charts were reviewed for compliance with guidelines. A kappa score for inter-observer agreement, Fisher's exact and Chi-Square tests were used to compare groups. In a retrospective review, charts were evaluated for continued compliance with guidelines in an analogous fashion.
Results: The kappa for inter-observer agreement was 0.91 (95% CI:0.883 to 0.990) Patients Administered Medication / Patients Eligible to Receive Medication ASA Beta-Blocker Heparin 2B, 3A GP-inhibitor Phase 1 213/221 (96%) 166/221 (75%) 55/221 (70%) 4/10 (40%) (no order sheet available) Phase 2 117/117 (100%)112/117 (96%)* 110/117 (94%)*4/6 (67%) (with use of order sheet) Phase 2 205/214 (96%) 163/214 (76%) 135/214 (63%) 3/7 (43%) (without use of order sheet) Phase 3 194/204 (95%)147/199 (74%) 138/201 (68%) 3/9 (33%) (without use of order sheet) (* P,0.001 compared to Phase 1)
Conclusions: The use of a standardized chest pain order sheet was associated with improved adherence to the ACC/AHA guidelines for administration of beta-blockers and heparin in ACS but returned to baseline when the guideline was no longer available. Limitations of this study include, but are not limited to, non-randomization and selection bias.

7 A Look at Pre-Hospital Practice Patterns Following the Introduction of Drug-Facilitated Intubation

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Objective: We conducted this study to evaluate the patterns and frequency of use of drug-facilitated intubation (DFI) by pre-hospital personnel following its introduction and availability.
Methods: This was a retrospective study of reported pre-hospital data on number of patients in which drug-facilitated intubations were performed between January 1, 2003 and July 31, 2006. For inclusion into the DFI data, the patient had to receive succinylcholine before an attempt at intubation by pre-hospital personnel and meet the indications set forth by standing orders for DFI, specifically presence of incomplete relaxation or high likelihood of losing an airway during transport. Patients in cardiac arrest were excluded from this study. The number of patients receiving DFI was compared to the total number of patients who were not in cardiac arrest that were intubated. The percentage of total non-arrest intubations that were drug facilitated was then calculated for each year between 2003 and 2006 with data through July 2006. Statistical analysis was performed using the Chi-square test. Trend analysis was performed using ANOVA and the Tukey test.
Results: The percentage of drug-facilitated intubations compared to total non-arrest intubations was 57.8%, 45.0%, 34.1%, and 71.1% for 2003, 2004, 2005, and the first 7 months of 2006 respectively. The percentage of DFI in 2003 (57.8%) compared to the percentage in 2004-2005 (38.8%) was statistically significant ($p<0.001$). The percentage of DFI in the first 7 months of 2006 (71.1%) compared to the percentage in 2004-2005 (38.8%) was also statistically significant ($p<0.0001$). ANOVA showed a significant quadratic trend in the use of DFI over time.
Conclusions: These data support the hypothesis that there was an initial peak in usage of DFI after the availability to pre-hospital personnel in 2003, and that after a decline the rates were increasing as users became more familiar and comfortable with its use.

8 Pre-Hospital Time Measures for Acute Stroke Patients

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Introduction: Poor rates of thrombolysis for acute stroke partially result from lack of recognition and delayed hospital arrival by patients. Even though EMS transports reduce time to hospital arrival, acute strokes missed by both emergency medical dispatchers (EMD) and paramedics may result in prolonged transport times.
Objectives: We sought to determine pre-hospital time delays for acute strokes in a large urban EMS system.
Methods: Retrospective study of patients >18 years identified as having acute stroke by EMD, city paramedics or stroke neurologists transported to hospitals by EMS personnel from 1/1/2005 to 12/31/2005. Data were acquired from a computer-assisted dispatch, a computerized paramedic, stroke team databases and ICD-9 codes. The final diagnosis of stroke/not stroke was identified from stroke team diagnosis or ICD-9 codes. Paramedic time to scene (TS), scene time (ST) and total run time (RT) were compared between missed and true strokes. Time intervals were calculated when EMS personnel had diagnostic agreement/disagreement using a Mann-Whitney U test for nonparametric data; medians and Inter Quartile Ranges are reported.
Results: A total of 1067 patients were eligible for the study, of which 22 were excluded for missing data. The stroke team identified 440 (41%) of which EMD missed 73 (16.6%) and paramedics missed 247 (56.1%). For true strokes, EMS personnel were in agreement 27.3% of the time. ST and RT were significantly different when EMS personnel were in agreement on stroke (ST=19 min.; IQR=16,24 and RT=39 min.; IQR=33,45) compared to not inagreement (ST=18 min.; IQR=14,22 and RT=36.5 min.; IQR=30,43 p's<0.001). Time measures did not differ between true and missed strokes (p's>0.05).
Conclusions: Pre-hospital scene time and run times for acute strokes are less when there is diagnostic concordance between dispatchers and paramedics. Future efforts should focus on improving the stroke recognition by all levels of pre-hospital providers.

9 Utilization of Computed Tomography Angiography in the Evaluation of Acute Pulmonary Embolus

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Objectives: To assess the appropriate use of computed tomography angiography (CTA) in the diagnostic evaluation of acute pulmonary embolism (PE).
Methods: Review of 580 inpatient (45%), emergency department (ED) (41%) and outpatient (14%) CTAs to evaluate for acute PE performed at a large teaching hospital from January 2004 through March 2005. Based on chart review blinded to final diagnoses, PE pretest probability using Wells criteria was retrospectively assigned. D-dimer values (if obtained) were also reviewed.
Results: Of the 580 patients scanned, only three were high probability; two of these had PE (67%). Of the remaining 577, 48% were intermediate and 51% were low probability. The overall positivity rate for PE was 10%; inpatient 12%, ED 8%, and outpatient 1%. Of the high, intermediate and low probability groups, 67%, 14% and 5% had PE, respectively.

D-dimer was only ordered on 39% of all patients; 17% were negative (<0.5), 47% intermediate (0.6-2.0) and 36% positive (>2.0). Only one patient with a negative D-dimer and three patients with an intermediate D-dimer had PE. CTAs obtained in low and intermediate D-dimer groups comprised 25% of the total. Of the ED patients, 21 had PE (9%); 50% in the high group, 15% in the intermediate group and 2% in the low group. In the ED, 59% had a D-dimer drawn; 21% were negative, 54% intermediate and 25% positive.

Conclusion: CTA is fast, diagnostic and widely available for evaluation of acute PE. Wells criteria stratify patients and guide the PE workup. Our data show suboptimal use of Wells criteria and subjective overestimation of PE probability prior to CTA. Negative D-dimer also does not deter unnecessary CTA. This represents a paradigm shift in which clinical tools are supplanted by imaging that, while noninvasive, is not without cost or risk. While no definitive acceptable positivity rate for CTA has been established, we feel 10% represents use of CTA as a screening rather than diagnostic test, equating to ineffective resource utilization and unnecessary radiation exposure.

10 Distribution of Emergency Department Diagnoses Presenting to Oregon Emergency Departments

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Objective: To examine the distribution of diagnoses that present to Oregon emergency departments (EDs).

Methods: Claims data on 2,299,151 visits to a representative sample of 21 Oregon EDs from August 2001 through February 2005 were analyzed using a cross-sectional approach. The AHRQ multi-level CCS data tool was used to define diagnostic categories. Frequencies were examined for the most common diagnostic categories at each CCS level and at the level of ICD9 classification.

Results: The top five most common CCS Level 1 diagnostic categories were injury and poisoning (28%), diseases of the respiratory system (12%), signs/symptoms (11%), neurological diseases (8%), and diseases of the circulatory system (8%). In looking at injury and poisoning, the most common diagnoses in this category included sprains and strains (7% of all visits), open wounds (6%), superficial injuries and contusions (5%), and fractures (4%). The majority of respiratory diagnoses consisted of asthma (1%) and respiratory infections (7%) - including upper respiratory infections (4%), pneumonia (2%), and acute bronchitis (1%). Other common diagnoses included abdominal pain (4%), headaches (3%), spondylosis/disc disorder (3%), nonspecific chest pain (3%), otitis media (2%), teeth and jaw complaints (2%), urinary tract infections (2%), cellulitis/abscess (2%) and dysrhythmias (1%).

Conclusion: From a public health perspective in the state of Oregon, injury prevention programs may have a significant impact on ED use. The high volume of visits for upper respiratory infections, teeth complaints, and disc disorders highlights the role of the ED as a safety net for patients who cannot get care elsewhere. In addition, lack of access to primary care may be a contributing factor for the 28,818 visits for asthma, illustrating how lack of access can promote acute exacerbations of chronic conditions that are seen in the ED.

11 Length of Stay Following Trauma Is not Affected by Ethnicity When Controlled for Ethanol Intoxication

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Introduction: Studies have demonstrated that, from pre-hospital mortality rates to emergency department (ED) evaluation to post-injury recovery, trauma care is fraught with examples of the health care race gap. Many of these studies have not properly controlled for ethanol and drug intoxication. We completed a study to address race differences on length of stay and mortality in traumatized patients, controlling for ethanol intoxication.

Methods: Data were entered prospectively in the Trauma One by Lancet database by research assistants (RNs, etc.) following any level one trauma patient seen in the ED from January 1, 2001 to October 31, 2005. Data were analyzed using SPSS 15.0 (SPSS, Inc, Chicago, Il.). Descriptive statistics as well as logistic regression predicting odds of > two days length of stay (LOS) were conducted. Ethanol use was defined as blood alcohol level greater than 10 mg/DL. Race was self-described by patients or families.

Results: A total of 6,102 patients were analyzed. Mean age was 29.8 [SD 17.5] years, and 3,364 (55.1%) of patients were male. Univariate odds ratios with regard to length of stay (95% Confidence Interval) were: Native American 1.08 (.903, 1.30), Asian .681 (.390, 1.19), Black .786 (.594, 1.04), Hispanic .731 (.640, .836) and White was used as the reference. In multivariate analysis adjusting for age, sex, alcohol and drug status, and injury severity, however, race was no longer a significant predictor of LOS. A total of 156 (2.6%) died. Age, alcohol and drug use, and injury severity were associated with risk of mortality. No statistically significant differences were noted among different ethnicities with regard to risk of death.

Conclusions: There is not a significant difference between Native American and White patients following trauma. Although a slight trend was noted in increased LOS in Native Americans in comparison to Whites, this trend was eliminated when ethanol use was controlled.

12 Emergency Department Length of Stay and Predictive Demographic Characteristics

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Objectives: Emergency department (ED) crowding continues to be a significant national concern. However, there is a paucity of data on the disparities in length of stay (LOS) by ethnicity and insurance coverage. We sought to identify associations between LOS and patient demographic characteristics, using three years of a nationally representative database.
Methods: Retrospective cohort study. We used data from the 2002 to 2004 National Hospital Ambulatory Medical Care Survey (NHAMCS), a nationally representative database containing information on ED patients, their diagnosis, and length of stay. Our empirical approach accounted for hospital-specific differences, adjusted for the number of procedures and diagnoses for each patient (as a proxy for patient complexity), and included data on day-of-week (as a proxy for typical ED flow).
Results: From 2002 to 2004, NHAMCS collected data on 114,179 ED visits, representing a weighted estimate of 334.3 million national visits over three years. Mean LOS for discharged patients was 167.4 minutes (95% CI 162.1-172.8); patients admitted to the hospital had a mean LOS of 363.4 minutes (95% CI 338.4-388.3). After adjusting for patient severity and individual hospital effects, longer LOS was associated with nonwhite patients (an additional 10.6 minutes, 95% CI 4.0-17.1) and patients who were uninsured (an additional 8.7 minutes, 95% CI 1.4-15.9). Moreover, differences in LOS are primarily attributable to the portion of time spent in the ED waiting to see the emergency physician. For example, compared to white patients, nonwhite patients waited 5.4 minutes longer (95% CI 3.4-7.4) to see a physician.
Conclusions: Disparities exist in ED LOS, with nonwhite and uninsured patients experiencing longer lengths of stay. Interventions to reduce ED crowding should consider efforts that aim to reduce wait times for underserved populations.

13 Hand Surgeons' Perceived Barriers and Solutions to Emergency Call

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Objectives: Sub-specialty shortages are a growing threat to public healthcare. Surveyed emergency physicians and administrators cite the difficulties of liability, costs, and lack of reimbursement. Our study explores hand surgeons' perceived barriers and potential solutions to taking call.
Methods: An IRB-approved, anonymous electronic survey was sent to the American Society of Surgery of the Hand list serve. Respondents ranked perceived obstacles (payment, liability, lifestyle, and inconvenience) and potential solutions (fixed payment per call, reimbursement rate per patient, and liability assistance). Respondents listed specific requirements to do more call. Comments were solicited qualitatively.
Results: 614/2054 (30%) of surveys were returned. Respondents varied by location, practice type, and call coverage. Barriers cited were lifestyle (42%), dumping (11%), uninsured patients, and liability concerns (10% each). The preferred incentive was pay-per-call (58%), followed by a guaranteed reimbursement per patient (27%). Results did not significantly vary by geographic location. Respondents gave 632 qualitative comments, calling for improved management and referrals (48%), prevention of dumping (12%), availability of rooms and staff (11%), and earlier triage/consultation (3%). Eighty-three percent would increase call for money. Fifty percent would take more call for $1500/night, 150% of Medicare reimbursement guaranteed-per-patient, or $45,000/year in liability assistance.
Conclusions: Hand surgeons' barriers to call were lifestyle, dumping, and financial concerns. Professional and personal frustrations were evident in the qualitative analysis. Respondents called for defining appropriate referrals. Fixed pay-per-call was the preferred incentive. $1,500/night, 150% of Medicare reimbursement guaranteed, or $45,000/year of liability assistance would increase coverage 50%. Our survey is a novel step focused on hand surgeons. Further research should explore incentives, mandates, and standardized protocols in other specialties.

14 Severe Traumatic Brain Injury: Stabilization or Definitive Care

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Objectives: We conducted this study to determine whether there is a mortality reduction conferred by direct transport to the trauma center from the scene when compared with inter-facility transfer (IFT).
Methods: This is a retrospective cohort study of all patients over the age of two who suffered a traumatic head injury and were transported across county lines to a regional Level I trauma center for neurosurgical care between January 2002 and November 2006. Patients with suspected TBI resulting in a GCS less than 9 were included. Patients were stratified according to whether they were directly transported (DT) from the field or via IFT after initial stabilization and resuscitation at a Level III trauma center. Data obtained from the trauma registry included patient demographics including age, sex, and race, time of ambulance arrival, mechanism of injury, initial

vital signs, GCS, patient disposition from ED and final clinical outcome. Logistic regression and chi-square statistics were applied to compare mortality rates between the two groups.
Results: A total of 94 IFT and 379 DT cases were studied. Cases were matched according to GCS. The median time for direct transport was 26 minutes while the median time of IFT was 151 minutes. A total of 77.7% of all patients arriving by IFT survived to discharge compared with 71.2% of DT patients (p=0.21). The odds ratio for survival (IFT/DT) was 1.40. The logistical regression demonstrated a small but statistically insignificant contribution to survival for each additional stabilization minute for patients from an IFT.
Conclusions: Direct transport to a neurosurgical-capable trauma center from the scene for patients with GCS less than 8 does not confer a survival benefit when compared with patients taken to the nearest hospital before IFT. We recommend that pre-hospital triage guidelines include provisions for initial stabilization at a Level III center in lieu of mandatory transport to the regional Level I trauma center.

15 Prophylactic Antibiotics for Dog Bites: A RCT with Refined Cost Model

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Background: The use of prophylactic antibiotics remains controversial with conflicting results from a meta-analysis and Cochrane review.
Objectives: 1) Determine estimates of outcomes from dog-bite wounds comparing current treatment with and without antibiotics. 2) Use these estimates in a cost model to generate treatment recommendations.
Methods: A two-center randomized double blind placebo controlled trial comparing amoxicillin/clavulinic acid vs. placebo considered all dog bites, regardless of site. We excluded immunosuppressed patients, those with penicillin allergy and wounds > 12 hours old and those with suspected neurovascular, tendon, joint or bone injury. Patients were randomized to treatment, and structured follow-up was done after 14 days to determine the presence of a wound infection. Continuous data were compared with t-test and categorical data with chi square analysis. Data generated with 95%CI were then used in a cost model and a sensitivity analysis done to determine thresholds for treatment.
Results: We considered 230 consecutive dog bites, 146 were eligible, 6 were missed, 33 refused, and 97 consented to participate. Seventy-two percent were non facial, 62% were full thickness and 14% were sutured. There were no differences in demographic or clinical characteristics between the groups. Overall infection rate was 2% (95% CI 0-7%), none in the antibiotic group 0% (95% CI 0-6%) and 2 in the placebo 4.5% (95%CI 1-15%). Both infected wounds were sutured and on the face. The cost model determined antibiotics would always be cost effective when the infection rate was greater than 5% and never be cost effective if the rate was < 3%.
Conclusion: Our infection rate was much lower than older studies. Antibiotics consistently show a trend towards benefit and our model recommends treating any wounds at greater than 5% risk of infection. Further research should focus on the current infection rate of dog bites and identifying factors associated with high risk wounds, not on the benefits of antibiotics.

16 Ski Patrollers: Reluctant Role Models for Helmet Use

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Objectives: Ski helmets reduce the risk of brain injury, but helmet use is low. Ski patrollers (SPs) could serve as role models for helmet use, but little is known about their practices and beliefs. We studied: The frequency of helmet use by SPs; reasons for non-use; and beliefs predictive of helmet use.
Methods: A survey was completed by a convenience sample of SPs attending conferences. Questions addressed helmet use, head injury experience (self, family, friends) and knowledge of helmets and injury risk reduction. Helmet use was defined as "100% use during patrol skiing." To assess predictors of helmet use, odds ratios and 95% confidence intervals were calculated, after adjusting for seasons skied.
Results: Among 93 SPs, most were men (79%), < 45 years old (70%) and experienced (mean seasons skied = 26 ± 11). Helmet use was 21% (CI95 = 14-31). Common reasons for non-use were hearing (35%), comfort (28%) and vision (24%); only 16% cited "socially unacceptable." Most SPs believed helmets prevent injuries (90%) and that SPs are role models (93%). Head injury experience was common (23%). However, many SPs believed helmets encourage reckless skiing (39%) and increase injury risks (16%). Four factors predicted helmet use: head injury experience (9.8; 1.02-94); perceived exposure protection (OR = 9.7; CI95 = 3.1-29.8); belief that role modeling is an advantage of helmets (3.5; 1.1-10.6); and belief that helmets encourage reckless skiing (.17; .03-.83).
Conclusions: Although based on self-reports by a small convenience sample of SPs, these data suggest there is discordance: SPs are convinced that helmets reduce serious injury and that they are role models, but most do not wear helmets regularly. Manufacturers should address helmet design and comfort. Education programs should include head injury cases, address the belief that helmets encourage recklessness (risk homeostasis) and stress role modeling as a professional responsibility.

17 The Reliability of Triage Classification as a Predictor of Severity in Major Trauma

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Objective: To determine which clinical parameters can be used to reliably identify severely injured trauma patients in the Emergency Department.
Methods: A retrospective study of all adult patients (>14 years) identified on our prospectively maintained Level I Trauma Center Registry at this inner city hospital over a six-month period. Medical records were reviewed for mode of arrival and triage classification assigned. We calculated Revised Trauma Score (RTS) and Injury Severity Score (ISS) for each patient. Admission to the SICU or to the OR or an operation within 48 hours of arrival was used as identifiers of severe injury.
Results: Of the 208 patients included in the study, 100 (48.08%) met criteria for severe injury. Ninety five patients (45.67%) were brought in by EMS as resuscitations, 76 (36.54%) were brought in by EMS but not as resuscitations, and 37 (17.79%) were walk-ins. Forty-four (46.32%) of the resuscitation patients, 34 (44.74%) of the non-resuscitation patients, and 22 (59.46%) of the walk in patients met criteria for severe injury (P =0.275). Nurses assigned 112 patients to Triage Class A, 80 to Class B, 2 to Class C, and 14 were not assigned. Fifty-three (47.32%) of Triage A patients, 41 (51.25%) of B patients, and 1 (50%) of the C patients were severely injured (P=0.604). There was a 75.26% concordance between mode of arrival and triage classification (kappa =0.578). The calculated mean RTS of the severely injured patients was 7.59 and of those not severely injured, 7.82 (P=0.010, odds ratio 0.1645). The ISS for the severely injured patients was 33.5 and for those not severely injured, 27.2 (P=0.001, odds ratio 1.040). Age adjusted logistic regression did not alter the results.
Conclusions: Emergency physicians traditionally rely on mode of arrival and triage classification as predictors of the severity of injury in trauma patients. Both of these parameters are highly unreliable. Ambulatory trauma patients in our study had a greater than 50% incidence of severe injury. Triage classification is well correlated with mode of arrival and poorly correlated with injury severity. RTS, previously indicated for use as a medical triage instrument, proved to be unreliable in our study. The ISS proved to be the most reliable tool. Further study should be undertaken to validate its reliability and consideration should be given to using ISS to evaluate trauma patients on arrival to the Emergency Department.

18 Pediatric Trauma Video Review: An Underutilized Resource

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Background: Traumatic injuries continue to be the number one cause of mortality in patients ages 1-44 years in the U.S. Successful trauma care often requires a coordinated team effort. Trauma video review (TVR) has been identified as an effective method of quality improvement and education.
Objective: The objective of this study is to determine the TVR practices of pediatric trauma centers in the U. S. and their use of video review for quality improvement and education.
Methods: Pediatric trauma centers accredited by the American College of Surgeons (n=16) and the National Association of Children's Hospitals and Related Institutions (n=24) were identified and surveyed by telephone. Surveys included questions regarding program demographics, residency information and details about past and present TVR.
Results: Forty pediatric trauma centers were contacted over a two-month period; four reported not to be trauma centers. Ninety-four percent (34/36) of trauma centers completed the surveys. Twenty-seven percent (9/34 centers) are currently using TVR; 38% (13/34) previously used TVR, but stopped due to legal concerns or technical problems; and 35% (12/34) never used TVR. Nine reported that a TVR program was under development. Total planned or current use is 53% (18/34). All currently videotaping programs confirmed that TVR has improved their trauma process. Eighty-eight percent (30/34) have emergency medicine (EM) and/or pediatric emergency medicine (PEM) trainees. Two centers specifically use recorded traumas for resident education. Eight programs do not allow EM (7) or PEM (1) trainees to participate in trauma resuscitations; two of these programs allow trainees to attend TVR conferences.
Conclusions: Most pediatric trauma centers are using or planning to use TVR but few are using it for resident education. Emergency medicine trainees may have limited pediatric trauma experience. Future studies should focus on identifying potential uses of TVR for resident education and impediments to TVR program establishment.

19 Short Stay Admissions: Emergency Department (ED) Observation Unit (OBS) Compared to In- Hospital

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Background: Admission to an emergency department (ED) observation unit (OBS) provides an option to hospital (HOSP) admission for selected patients.

Methods: We retrospectively reviewed a cohort of patients >2 months old admitted either to OBS or HOSP who had stays < 24 hrs during a 26 month study period at a Level I trauma center, adult and children's university hospital with 40,000 ED census and a 10-bed ED OBS. Exclusions were: elective, day surgery, and pregnancy-related admits; patients with major procedures; and deaths and zero charges. Using a two-sample t-test for continuous variables and chi-square test for discrete variables, we compared total facility charges (CHARGES) in dollars and length of stay (LOS) in hours for the cohort and for selected diseases using ICD-9-CM categories. Significance was set at $p < 0.01$ or <0.05.
Results: Adjusting for age, gender, LOS, ICD-9 category and insurance class, linear analysis of covariance (ANCOVA) demonstrated significant difference in log of charges. A similar model without LOS found significant difference in log LOS. OBS admits had a larger percent of non-sponsored patients (17.4 vs 7.5, $p <0.05$) and fewer patients returning within 72 hours of discharge for readmission to the hospital (1.5% vs 2.2%, $p<0.05$).

20 Factors Important to Emergency Medicine Residency Applicants in Selecting a Residency Program

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Oregon Health & Science University

Background: Little is known about the factors important to applicants when selecting an emergency medicine (EM) residency program. We sought to identify factors important to applicants when selecting a training program, and determine whether there were gender differences in the factors that applicants value.
Methods: This observational study surveyed interviewees at an EM residency program from November 2005 to February 2006. Applicants were asked to rate each of 18 factors from "not at all important" to "very important" in their selection of an emergency medicine residency program. Participation was voluntary and anonymous.
Results: 73 of 82 interviewees (89%) completed the survey. The factors with the top five mean scores were: how happy the residents seemed (3.9), program personality (3.8), faculty enthusiasm (3.7), geographic location (3.6), experience during interview day (3.5) and pediatrics training (3.5).
Conclusions: The top three factors deemed most important to emergency medicine applicants are primarily intangibles, while programs have no control over the fourth most important factor, location. Still, programs aware of these findings may choose to emphasize these intangibles as well as the geographic strengths of their city in order to maximally appeal to potential residents. Further research is needed to investigate in more detail what aspects of the interview-day experience are most meaningful, as this may be the factor over which program directors have the most control.

21 Attending and Resident Satisfaction with Feedback in the Emergency Department

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Objectives: Effective feedback is a core component of medical education. Little is known of emergency medicine (EM) attending and resident perceptions of the feedback they give and receive in the emergency department (ED). This study aims to characterize the overall satisfaction of EM attendings and residents with feedback in the ED. We hypothesized that attending and resident perceptions of the ED feedback would differ significantly.
Methods: This observational study was conducted in an EM residency program. Attendings and residents received unique but similarly worded web-based surveys. The primary outcome was overall satisfaction with feedback in the ED, measured on a 10-point scale. Additional items assessed satisfaction with specific aspects of feedback and whether attendings or residents were more likely to initiate feedback. The attending and resident responses were compared using a two-sample t-test for continuous variables and a c2 test for discrete variables.
Results: 24 of 32 attendings and 15 of 27 residents completed the survey. Attendings were significantly more satisfied overall with feedback in the ED (6.4 vs. 4.5, $p=0.01$). Attendings were more likely than residents to report good or excellent satisfaction with the timeliness of feedback (50% vs. 13%, $p=0.04$), quality of positive feedback (88% vs. 46%, $p=0.01$), quality of constructive feedback (58% vs. 13%, $p=0.01$), feedback on communication and professionalism (63% vs. 20%, $p=0.02$) and feedback on managing patient flow (54% vs. 20%, $p=0.05$). When asked who usually initiates feedback, attendings were more likely to report that the attending usually does (96% vs. 27%, $p<0.01$). The study achieved 80% power to detect the primary finding ($\alpha=0.05$).
Conclusions: Attending satisfaction with the timeliness and quality of feedback they give in the ED is significantly higher than resident satisfaction with feedback they receive. There is also significant difference in their perception of who initiates feedback.

22 Use of a Single Expert Reviewer Instead of End Users to Evaluate a Decision Support Tool

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Background: Development of a decision support tool (DST) requires end-user feedback during prototype testing. This process is logistically difficult and would be eased if the evaluation of a single expert evaluator accurately reflected that of the end users.
Objective: To determine the agreement between physician evaluation of the performance of a case-based reasoning (CBR) DST with that of a single expert reviewer.
Methods: Ten EPs and three midlevel providers were presented with the results of a CBR-based DST designed to predict disposition of children presenting to the ED with bronchiolitis. Each rated their agreement with the predicted disposition, the explanatory case and the explanatory dialogue generated by the software. The expert reviewer, a pediatric EP, initially reviewed case notes blinded to the original disposition. A second evaluation was performed after four months when the case notes were reviewed alongside the CBR output. Evaluators used a five-point descriptive scale, which was converted to a numeric scale for analysis.
Results: The case notes and DST output of 109 patients were evaluated. Where the end user and expert evaluator agreed on the need for admission, agreement on the CBR tool's prediction of disposition was 88.2%(expected 70.6%) κ 0.585 p< 0.001. Where the reviewer and end user disagreed on the disposition, agreement was 61.7% (expected 62.6%) κ -0.026 p=NS. When both subsets were combined, agreement was 84.9%(expected 70.9%) κ 0.483 p<0.001. There was only fair agreement on the value of explanation case provided by the software (observed agreement 69.5%(expected 56.7%) κ 0.296 p <0.001). There was poor observed agreement on the usefulness of the explanation provided of 61.6%(expected agreement 55.4%), κ 0.139 p=0.07.
Conclusions: A single expert reviewer had moderate agreement with end users when evaluating a CBR based DST predictions for disposition. This agreement waned progressively as the subjectivity of the components being evaluated increased.

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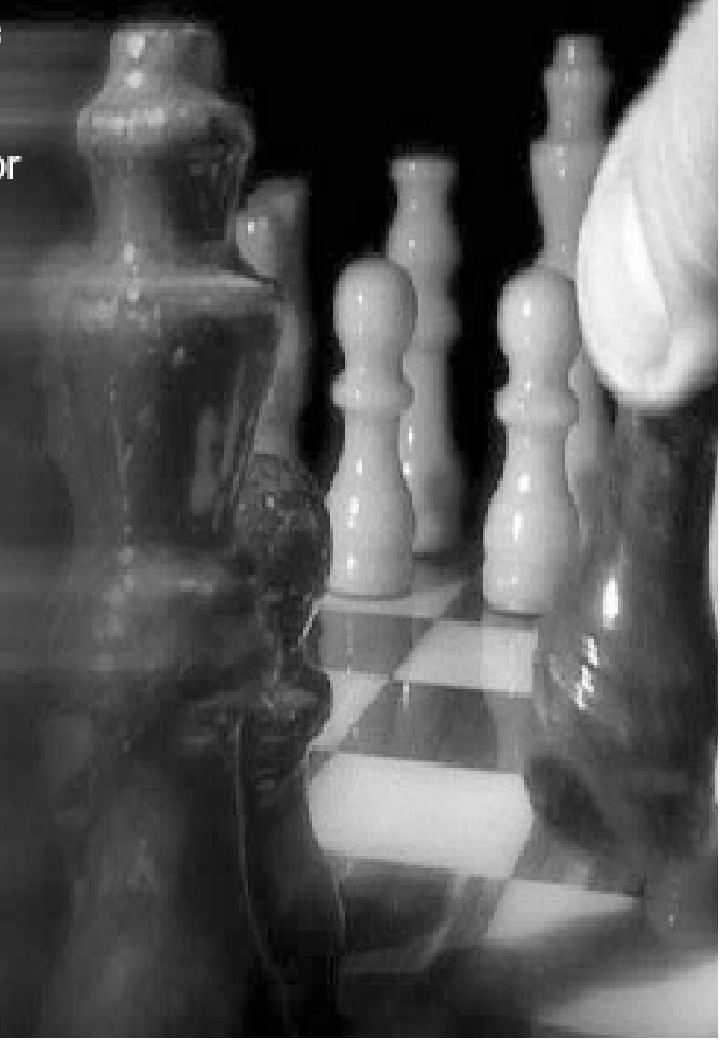

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