INTRODUCTION

The disposition decision to admit or discharge a patient is one of the most important decisions made during a patient’s encounter with the emergency department (ED). Every year in Canada, there are an estimated 15.8 million visits to EDs.1 Of these, 80% of patients are discharged home or to assisted living.1 The discharge decision occurs in an environment of time pressure and ED crowding. If a discharge decision error is made, it could place patients at risk for adverse outcomes.

Our previous research has shown 8.5% of patients triaged to high-acuity areas of the ED suffer adverse events (adverse outcomes related to healthcare management).2 Half these occurred among discharged patients and 70% were preventable. Furthermore, our previous work highlighted unsafe disposition decision making as a source of error, particularly for high-acuity patients being discharged home.2 3 ED physicians receive little training on how to make the disposition decision and there is sparse data about how these decisions are made. Applied research in this area has focused on the implementation of decision rules or algorithms for narrow, predefined patient groups, such as those presenting with chest pain, children with croup, or women with pyelonephritis.4–9 The issue of disposition decision making has implications for the safety of all patients who present to EDs.

The purpose of this study is to identify the factors that contribute to physicians’ decisions to discharge a prospective cohort of patients from geographic high-acuity areas of the ED, and whether decision-making rationale impacts on the occurrence of adverse events.

METHODS

Study design

We conducted real-time qualitative interviews of ED physicians at the time of the discharge decision at The Ottawa Hospital from June to August 2008. We then followed patients prospectively for adverse outcomes. The Ottawa Hospital Research Ethics Board approved this study.

Study population and setting

We studied the staff ED physicians practicing in the geographic high-acuity areas (Resuscitation, Emergent, Observation) of the Civic Campus ED of The Ottawa Hospital, a tertiary care academic centre in Ottawa, Canada, with 68 000 patient visits per year. Patients placed in these areas are triaged under the Canadian Triage and Acuity Scale (CTAS) as Resuscitation (1), Emergent (2), or Urgent (3).10 In Canada, there are no national performance benchmark requirements for disposition decisions.

Selection of participants and patient population

We excluded resident physicians and medical students. We did not interview physicians for decisions made for admitted patients or paediatric patients. We also excluded decisions made for patients transferred from outside centres for investigations only and not physician assessment. We included decisions made for patients who had return visits to the ED during the study period.

Data collection

Interview shifts were scheduled to include the three peak times in high-acuity area discharges: 08:00–11:00, 14:00–17:00 and 20:00–23:00. The research assistant obtained verbal consent at the beginning of each shift to conduct the interviews.
for each consecutive patient being discharged from a high-acuity area. The research assistant reviewed the chart and abstracted predefined variables such as: patient demographics, time of registration, length of ED stay, presenting complaint, vital signs, ED physician’s interpretation of ECGs and radiological investigations.

Measurement tool
We developed our survey tool in consultation with patient safety experts. We piloted the survey for 2 weeks among a convenience sample of ED physicians and modified the questions according to the feedback we received. We used Dillman’s method for interviews when administering our real-time survey.

At the time of discharge, the research assistant asked three open-ended questions: (1) What is the basis of this discharge decision? (2) Did you use any specific criteria in making the discharge decision? (3) What is the likelihood that this patient will return to the ED for the same problem within 1 month? If physicians asked for clarification on the meaning of the questions, they were given pre-determined prompts. The prompts for questions 1–3 were as follows: (1) Why did you decide to discharge the patient? (2) Did you use any evidence-based guidelines, clinical prediction rules or decision aids? (3) What is the likelihood that the patient will return to the ED for the same problem in the next month (low, moderate or high)? The data from the chart review and interview were directly entered into a handheld device that was synchronised to a Microsoft Access database weekly.

Outcome measures
The primary outcomes were the most common themes for the basis of the discharge decision (question 1). The secondary outcomes were the rationale for the discharge decision in terms of use of evidence or other criteria (question 2) and the occurrence of adverse events. The responses to the first two survey questions were coded by the principal investigator using a qualitative inductive approach after all data were collected. Categories were identified from the data in an iterative fashion and were grounded in the data. The codes were then reapplied separately by the research assistant. Discrepancies were identified and discussed until consensus was reached and all responses were fitted into categorical themes.

Adverse event assessment
Adverse events were measured using a standardised, previously piloted method. We searched the electronic health record database for flagged outcomes in order to identify adverse events. Flagged outcomes included any patients who died, had an unscheduled admission, ED or clinic visit within 30 days. Patients with flagged outcomes that were judged to be due to progression of disease were not classified as adverse events.

Three specialty-certified attending ED physicians were trained in adverse event assessment. Reviewers were blinded to patient name, gender and treating physician. Reviewers categorised adverse events according to type, severity and preventability (see online supplementary appendix A). They used a six-point Likert submitted scale to determine their confidence in healthcare management causation of the flagged outcome (1=no evidence for management causation, 6=certain evidence for management causation). If two out of three reviewers had a level of certainty greater than 4/6 (ie, 5/6 or 6/6), we classified the flagged outcome as an adverse event. We defined a preventable adverse event as an adverse event caused by a healthcare management problem, such as a diagnostic issue, management issue, unsafe disposition decision or suboptimal follow-up.

Data analysis
We described the study population and adverse event proportions using descriptive statistics. We used χ² tests for associations between decision rationale and: (1) physician or patient characteristics and (2) adverse events. We calculated ORs for associations between physician characteristics and adverse events.

RESULTS
We interviewed 32/36 (88.9% response rate) ED physicians regarding 366 patient encounters. See figure 1 for reasons for exclusion. In terms of physician characteristics, the mean age was 41.4 (SD 7.0) and the majority were male (71.9%). The majority (62.5%) of ED physicians’ training was the 3-year family medicine-based emergency training Canadian College of Family Physicians, Emergency Medicine Fellowship (CCFP-EM), and the remainder had 3-year emergency specialty training Fellow of the Royal College of Physicians and Surgeons of Canada (FRCP). There was a mean of 34.3 (SD 7.9) discharges per ED physician over the course of the study. We interviewed the physicians for a mean of 10 discharges each, representing approximately 25% of the discharge decisions that each ED physician performed during that time period. Over half (53.1%) the surveyed physicians had more than 10 years of clinical experience.

Table 1 describes the patient characteristics for the 366 encounters. The mean age was 60.1, and half (54.1%) were women. The majority (94.6%) was high-acuity with Canadian Triage Acuity Scores of 1–3. The most common presenting complaints were chest pain, weakness or dizziness and abdominal pain.

For our primary outcome, the most common themes of the basis of discharge decision making were resolution or control of patient symptoms, normal results of investigations and clinical criteria such as physical examination and vital signs (see table 2).

Table 3 shows an analysis of associations between physician and patient characteristics and decision rationale. Decision rationale was grouped into two mutually exclusive categories: clinical judgment (including specific clinical criteria) and evidence-based (including specific guidelines or consulting the literature) (see online supplementary appendix B). Family physician-based ED training (CCFP-EM) was the only physician characteristic shown to be significantly associated with the use of evidence-based practices in making discharge decisions. In order to adjust for a potential clustering effect by individual physicians, we also determined the mean proportion of each decision rationale for each physician and still demonstrated a statistically significant difference. The only patient characteristic associated with use of evidence-based medicine was location in the ED. The highest-acuity areas, Resuscitation and Emergent, had the highest rates of consultation in evidence of the making of the discharge decision. Examples of evidence-based decision-making rationale included clinical decision rules such as the Canadian CT Head Rule and the Pneumonia Patient Outcomes Research Team (PORT) pneumonia score. In the majority of cases, physicians stated that their decisions were made based upon clinical judgment (69.3%) and specific clinical criteria (18.3%) such as tolerating a walk test.

In terms of ED physicians’ ability to predict the likelihood of a return ED visit for the same complaint, these data are presented in figure 2. The sensitivity of ED physicians for predicting adverse events was 40.0% (95% CI 12.4 to 73.0%) and the
specifi city was 63.5% (95% CI 58.2 to 68.5%). We also examined the ED physicians’ ability to predict the occurrence of a flagged outcome and in this case the sensitivity was 8.9% (95% CI 3.0 to 19.6%) and the specificity was 91.5% (95% CI 87.8% to 94.4%).

The adverse event analysis is shown in table 4. Overall, there were 69 flagged outcomes out of the 366 discharge decisions (18.8%), and 10 were deemed adverse events (2.7%, 95% CI 1.1 to 4.5%). All were judged to be preventable, and the predominant adverse event types were diagnostic and management issues. There was no statistically significant association between decision-making rationale (clinical judgment or evidence based) and the occurrence of adverse events ($p=0.37$) or flagged outcomes ($p=0.82$). There were also no associations between physician characteristics and the occurrence of adverse events. Please see online supplementary appendix C for descriptions of the adverse events.

**Table 1** Characteristics of the 366 discharged patients

| Patient characteristic | n=366 (%) |
|------------------------|-----------|
| Mean age (SD: 20.0)    | 60.1      |
| Female                 | 198 (54.1)|
| Canadian triage acuity scale score | |
| Resuscitation (1)     | 1 (0.3)   |
| Emergent (2)          | 184 (50.3)|
| Urgent (3)            | 161 (44.0)|
| Less urgent (4)       | 18 (4.9)  |
| Non-urgent            | 2 (0.6)   |
| Location in emergency department | |
| Resuscitation (monitored) | 45 (12.3) |
| Emergent (monitored)  | 115 (31.4)|
| Observation (unmonitored stretcher) | 206 (56.3) |
| Presenting complaints |           |
| Chest pain            | 70 (19.1) |
| Abdominal pain        | 37 (10.1) |
| Weakness/dizziness    | 36 (9.8)  |
| Shortness of breath   | 29 (7.9)  |
| Trauma                | 27 (7.4)  |
| Discharge diagnostic categories | |
| Cardiac               | 100 (27.3)|
| Gastrointestinal      | 49 (13.4) |
| Genitourinary         | 32 (8.7)  |
| Trauma                | 31 (8.4)  |
| Neurological          | 29 (7.9)  |

**DISCUSSION**

This is the first study to evaluate, in ‘real time’, how ED physicians make discharge decisions. An important finding of this study is that physicians perceived that the majority of their discharge decisions were made using primarily clinical judgment, and that explicit consideration of published evidence when making these decisions was rare. Furthermore, this study suggests that physician training and patient location in the ED can influence whether or not an evidence-based approach is used in discharge decision making. Physicians were poor at predicting the likelihood of returning to the ED and having an adverse event, although the numbers were small. Finally, while we detected a low proportion of adverse events there was a high degree of preventability, particularly highlighting management,

**Table 2 Most common themes of basis of discharge decision for 366 discharged patients**

| Theme | n (%) | n=366 |
|-------|-------|-------|
| Resolution/control of symptoms | 114 (31.6) |
| Normal investigations | 105 (29.1) |
| Clinical criteria | 55 (15.3) |
| Diagnosis established | 53 (14.7) |
| No indication for admission/suitable for outpatient treatment | 53 (14.7) |
| Good follow-up in place | 40 (11.1) |
| Presenting signs/symptoms not worrisome | 39 (10.8) |

*Question 1: What is the basis of this discharge decision?\n†Some decisions had more than one theme.
diagnostic and unsafe disposition issues. These findings shed light on how discharge decisions are made and identify a need for enhanced decision support.

There are several possible explanations for why ED physicians stated that their decisions were mostly based on clinical judgment. First, there is little evidence available to guide clinical decision making. Even when evidence is available, knowledge translation is lacking in emergency medicine. One barrier to effective knowledge translation that has been cited in the literature is a cultural resistance of physicians towards algorithms and perceived ‘cookbook medicine’. Physicians also may disagree with the recommendations of specific guidelines, or question whether certain rules have been rigorously tested. For those decisions for which there is evidence available, it could be that physicians are either unaware of the evidence or that they may have incorporated it into their practice but are not consciously aware that they are using it.

We found some physician and environmental characteristics were associated with evidence-based approaches to decision making. When discharging patients from the highest-acuity areas of the ED, physicians were more likely to state that they were taking evidence into account. This could reflect the complexity and severity of medical illnesses which may have magnified the risks of making an inappropriate discharge decision. It has been shown that clinical decision rules are more likely to be adopted if they help simplify complex decisions, which may explain why evidence is used more frequently in the highest-acuity areas. ED physicians trained via the family medicine 3-year programme (CCFP-EM) were also more likely to state they were using an evidence-based approach. We hypothesise that this is a reflection of their shorter duration of training in emergency medicine, 1 year of specialised emergency medicine training (2 years of family medicine training) in comparison with 5 years for Royal College of Physicians and Surgeons of Canada (RCPSC) trained physicians. This may offer less time for the formation of heuristics or cognitive shortcuts that are the basis of rapid clinical judgment and may lead to a more systematic approach to decision making. We did not,

| Table 3 | Association between physician and patient characteristics and rationale for 366 discharge decisions* |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Physician characteristics† | Clinical judgment | Evidence-based | p Value | | | |
| Age | >40 | 129 | 17 | 0.96 | | |
| | <40 | 179 | 24 | | | |
| Sex | Female | 82 | 14 | 0.46 | | |
| | Male | 234 | 31 | | | |
| Experience | >10 years | 133 | 25 | 0.09 | | |
| | <10 years | 183 | 20 | | | |
| Training | CCFP-EM | 200 | 116 | 0.0007§ | | |
| | FRCPC | 40 | 5 | | | |
| Training clustered by physician (mean proportion) | CCFP-EM | 80.4% | 22.3% | 0.005 | | |
| | FRCPC | 97.2% | 7.5% | | | |
| Patient characteristics† | | | | | | |
| Age | >40 | 257 | 40 | 0.21 | | |
| | <40 | 59 | 5 | | | |
| Sex | Female | 175 | 23 | 0.59 | | |
| | Male | 141 | 22 | | | |
| ED location | Observation | 189 | 14 | 0.0007§ | | |
| | Emergent | 93 | 20 | | | |
| | Resuscitation | 34 | 11 | | | |

*Question 2: Did you use any specific criteria in making the discharge decision? †Missing values for five encounters. §Statistically significant values.

CCFP-EM, Canadian College of Family Physicians, Emergency Medicine Fellowship (3-years emergency training); ED, emergency department; FRCPC, Fellow of the Royal College of Physicians and Surgeons of Canada (5-year emergency training).

Table 4 Adverse events among 366 discharged emergency department (ED) patients

| Flagged outcomes | n (%) n=366 |
|------------------|-------------|
| Adverse events | 69 (18.8) |
| Adverse event type* | 10 (2.7) |
| Management issue | 9 |
| Diagnostic issue | 9 |
| Unsafe disposition decision | 7 |
| Suboptimal follow-up | 3 |
| Medication adverse effect | 2 |
| Fall | 0 |
| Procedural complication | 0 |
| Infection | 0 |

*Some adverse events had more than one type; all are counted and reported here.

Figure 2 Predicted likelihood of return to ED and occurrence of adverse events for 356 discharged patients*. *No predicted likelihoods for 10 patients. % Above each column is the proportion of adverse events for each category of prediction.

Figure 2 Predicted likelihood of return to ED and occurrence of adverse events for 356 discharged patients*. *No predicted likelihoods for 10 patients. % Above each column is the proportion of adverse events for each category of prediction.

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however, see a decrease in perceived use of evidence-based decision making in physicians who had been working for greater than 10 years as might be expected if experience in the ED fosters greater use of clinical judgment over evidence-based medicine.33

Limitations
There are several limitations to this study. First, emergency physicians may not have been able to describe their own decision-making processes. It has been postulated that people often cannot properly articulate exactly how they made a decision, and are unaware of the biases in their reasoning process.12 It is also possible that some physicians were subconsciously integrating evidence that they had read or learned in their training and did not identify it to the interviewer. Physicians were also on shift during their interview and may have felt pressured to answer the questions quickly due to time constraints. There may have been social desirability bias such that physicians felt they needed to cite a source of evidence for their decisions. The number of adverse events is small which limits the analysis of physicians’ ability to predict these events. Since our adverse event analysis was retrospective, it is subject to hindsight bias.  

Clinical and research implications
Our data demonstrate that safe disposition decisions were made during their interview and may not have identified it to the interviewer. Physicians were also on shift during their interview and may have felt pressured to answer the questions quickly due to time constraints. There may have been social desirability bias such that physicians felt they needed to cite a source of evidence for their decisions. The number of adverse events is small which limits the analysis of physicians’ ability to predict these events. Since our adverse event analysis was retrospective, it is subject to hindsight bias and outcome bias. And while we endeavoured to collect data on consecutively discharged patients, there is risk of selection bias if those excluded were systematically different from those we analysed.

CONCLUSIONS
We found that ED physicians perceive the discharge decision for high-acuity patients most frequently as one based upon clinical guidelines, clinical pathways, electronic decision support systems) to help prevent these outcomes. Furthermore, the observation that ED physicians performed suboptimally in predicting adverse events led us to consider that a feedback intervention may help enhance this capability.

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Contributors
Each author has contributed substantially to the production of the manuscript as follows: LC: responsible for idea for the project, methods, data analysis, drafting and revising manuscript and integrity of paper as a whole. TA: responsible for methods, data analysis, drafting and revising manuscript and integrity of paper as a whole. RC: responsible for data collection, involved in data analysis and revising manuscript. CV: involved in data analysis and revising manuscript. JP: involved in data analysis and revising manuscript. IS: involved in data analysis and revising manuscript. AIF: involved in data analysis and revising manuscript.

Competing interests
None.

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Appendix A: Adverse Event Definitions

Flagged outcome: death, unscheduled admission to hospital, unscheduled emergency department visit, unscheduled hospital clinic visit within 30 days.

Adverse event: an adverse outcome associated with emergency department management

Preventable adverse event: an adverse event caused by a health care management problem such as a diagnostic issue, management issue, unsafe disposition decision or suboptimal follow-up

Diagnostic issue: not acting on documented signs, symptoms, laboratory tests or imaging or not ordering an indicated diagnostic test

Management issue: suboptimal management plan despite accurate diagnosis or based on an inaccurate diagnosis

Unsafe disposition decision: patient placed at unnecessary risk of experiencing death or major disability by being sent home

Suboptimal follow-up: problems with follow-up arrangements led to the development of new symptoms, unnecessary prolongation of symptoms, an unscheduled return visit to the emergency department or a subsequent unscheduled hospitalization. (this could be due to inadequate availability of follow-up appointment, or due to inappropriate follow-up arrangements)

Medication adverse effect: patient experiences a symptom related to a medication regardless of whether the medication was appropriately prescribed or taken

Procedural complication: patient experiences adverse consequences of a procedure
Appendix B: ED Physician’s Discharge Decision Rationale

Clinical Judgement: 65.3%
Specific clinical criteria: 22.1%
Evidence-based guidelines: 9.6%
Consulted literature: 3.0%

Clinical Judgement
Evidence-based
Appendix C: Description of Adverse Events

1. 67 year old palliative patient with ovarian cancer presented with 2 weeks of shortness of breath on minimal exertion. No chest pain, cough, sputum, hemoptysis, previous DVT or pulmonary embolism, peripheral edema. Well’s score 1.0. Discharged after normal cell count and electrolytes and chest x-ray showing moderate pleural effusion. Diagnosis: shortness of breath secondary to pleural effusion. Returned 20 days later with left leg edema, worsening shortness of breath and died in ED of pulmonary embolism.

2. 42 year old patient with history of schizophrenia, resident of psychiatric hospital presented with acute abdominal pain for one hour. No fever, nausea or vomiting. Nurse notes “red colour” in urine. Patient noted to be drowsy, uncooperative with exam but tender suprapubically. Elevated white blood cells of 13.8 but otherwise normal electrolytes and liver function tests. Urine dip showed only ketones. Abdominal x-ray showed moderate stool, nil else. Patient given soap suds enema with result and discharged with diagnosis of constipation. Returned following day with blood in stool, worsening abdominal pain and diagnosed by CT abdomen with colitis of undetermined etiology.

3. 44 year old patient with history of Crohn’s disease presented with 48 hours of right lower quadrant pain (10/10). No fever, nausea or vomiting. No change in bowel habit. Decreased appetite. Tachycardic (110) on exam, abdomen tender in right lower quadrant but no peritoneal signs. Complete blood count and electrolytes were normal and urine dip was negative. Abdominal x-ray showed moderate stool and a few air fluid levels but no obstruction. Patient treated with analgesics and discharged with diagnosis of abdominal pain not yet diagnosed. Patient returned 12 days later with increasing pain and not passing gas per rectum. Diagnosed with large bowel obstruction and referred to General Surgery.

4. 78 year old patient presented with fever (38.2), feeling unwell and generally weak with urinary irritative symptoms. No nausea and vomiting and able to eat and drink. Febrile in ED, HR 92 and blood pressure normal. Looked well, bilateral CVA and suprapubic tenderness. Urine dip positive for leukocytes, ketones, nitrates and blood. Given one dose of intravenous antibiotics and discharged with oral antibiotics, diagnosis: pyelonephritis. Returned 9 days later with generalized weakness and
“electric shocks” travelling from head to feet. Patient had similar symptoms with quinolones in past which resolved with changing antibiotic. Patient prescribed a new class of antibiotic and discharged with diagnosis of adverse drug reaction.

5. 88 year old patient presented with chest pain, shortness of breath and palpitations. No fever, cough or vomiting. History of pacemaker insertion 3 days prior set for HR 70-110, with metoprolol dose reduced by half in previous week. Patient was tachycardic (153) with normal blood pressure. Clear chest, pitting edema bilaterally. ECG showed atrial fibrillation with ST depression in V5 and V6, chest x-ray was unremarkable. Serial cardiac enzymes negative. Patient treated with ASA and metoprolol with return to normal sinus rhythm. Cardiology consulted and refused. Patient discharged with diagnosis of rapid atrial fibrillation and possible pacemaker malfunction. Patient returned 7 hours later with nausea and palpitations. Daughter requesting admission for observation and respite. ECG showed atrial fibrillation with no ischemic changes. White blood cells high at 19, remaining cell count and electrolytes normal. Patient was given metoprolol and discharged with social work follow-up.

6. 63 year old patient presented with abdominal pain and 5 days of diarrhea and vomiting. No blood. Also fatigue, decreased appetite, fever, chills and 10lbs weight loss in 2 weeks. Associated gait imbalance and dizziness. History of ventriculo-peritoneal shunt inserted 6 months prior for hydrocephalus. On exam patient was tachycardic (97) with a generally tender abdomen. Normal neurological exam. Normal complete cell count and electrolytes. CT head and shunt surveys unremarkable. Discharged with diagnosis of diarrhea not yet diagnosed and plan to follow-up with neurosurgery in one week. Patient returned 19 days later with confusion, increased unsteady gait, blurred vision and headache. Admitted to Neurosurgery with shunt infection.

7. 44 year old patient with history of hepatitis C and chronic abdominal pain presented with severe abdominal pain for 2 days with associated obstipation and vomiting. Feverish, no change in bowel habit. Tachycardic (108), normal blood pressure. On examination, in obvious pain, abdomen diffusely tender. White blood cells elevated at 13.5, otherwise unremarkable cell count and electrolytes, serum lactate 2.3. CT abdomen reported as negative. Improved after analgesia and discharged with chronic abdominal pain. Returned following day with increasing abdominal pain, nausea and
8. 40 year old patient presented with palpitations and exertional chest pain for 2 days, burning and heavy with no radiation. No cardiac risk factors other than 10 packyr history of smoking. No pulmonary embolism risk factors. Tachycardic (111) normal blood pressure and unremarkable physical examination. EKG NSR 81, PR depression and PR increased in aVR. Chest x-ray unremarkable and cardiac enzymes negative. No pericardial fluid on bedside ultrasound. Discharge diagnosis: query pericarditis, prescribed ibuprofen and cardiology follow up in a few weeks. Returned 5 days later referred by family doctor to ED for ongoing pain, shortness of breath and looking unwell. Patient concerned about tender thyroid nodule. Patient had a history of a thyroid nodule with previously normal biopsy and TSH. Complete cell count, electrolytes, d-dimer and cardiac enzymes negative. TSH low (0.02) EKG normal sinus rhythm 91. Admitted to Internal Medicine with hyperthyroidism.

9. 57 year old patient with history of breast cancer being treated with radiation presented with fever, nausea, abdominal pain and loose stools for 4 days. Febrile in ED, otherwise normal vital signs and unremarkable physical examination. White blood cells borderline low (4.8) and anemic (Hb 113). Sodium and potassium low (139, 3.3), creatinine normal. Urine dip positive for nitrates, negative for leukocytes. Staff notes no dysuria or back pain but likely upper urinary tract infection. Discharged with diagnosis: UTI and antibiotics. Patient returns 3 weeks later with ongoing fever, malaise, chills and suprapubic pain. Left arm swollen and painful for one day. Blood culture drawn on initial visit was positive but never followed up. Patient admitted to Internal Medicine.

10. 83 year old patient with history of coronary artery disease presented with 24 hours of sharp, pleuritic, non-radiating chest pain without any associated symptoms. Relieved by nitroglycerin. Normal vital signs, tender anterior chest. EKG and Chest X-ray unremarkable. Single set of cardiac enzymes negative. Discharged with diagnosis of musculoskeletal chest pain. Returned to ED 3 subsequent times and 6 days later on 4th visit is diagnosed with a non-ST elevation myocardial infarction and admitted to Cardiology for percutaneous coronary intervention.