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Discordance between patient report and chart review of risk factors for antimicrobial resistance in ED patients[☆]

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Abstract

Objectives—The objective of this study is to identify the level of agreement between patient self-report and chart review for presence of antimicrobial resistance (AR) risk factors in emergency department (ED) patients.

Methods—This is a cross-sectional analysis of adult ED patients from July 2010 to January 2011. All ED patients 18 years or older were eligible. Exclusion criteria included pregnant women, prisoners, altered mental status, non-English speakers, traumas, and patients unable to provide consent. Data were obtained by ED patient interview and review of the preceding 3 months of the medical record. We report the difference between patient self-report and chart review of identifying 1 or more AR risk factors using McNemar's χ^2 . The test statistic was also calculated for individual risk factors and significance adjusted for multiple comparisons ($P < .003$). Agreement was calculated using κ with 95% confidence intervals (CIs). Risk factor domains assessed included nursing home residence, recent health care utilization, current indwelling devices, and medical history.

Results—Among 289 patients, 1 or more risk factors were reported by 68% (95% CI, 63%–74%) of patients and found in 59% (95% CI, 53%–65%) of charts, a difference of 9.7% (95% CI, 5.3%–14%) ($P < .001$; $\kappa = 0.72$). Patients were more likely to report recent antibiotic use (42% vs 29%; $P < .001$; $\kappa = 0.52$) and recent surgery (17% vs 11%; $P < .001$; $\kappa = 0.64$).

Conclusions—There is disagreement between ED patient self-report and medical record review for many AR risk factors. This could affect both clinical care and results of ED research studies relying on chart reviews. Patient self-report identifies a greater number of AR risk factors than chart review.

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1. Introduction

Obtaining accurate information regarding patient medical history is important both in delivering quality clinical care and in conducting accurate clinical research. Two sources for such information are patient self-report and the electronic medical record. In many settings, these 2 sources disagree [1–4]. The criterion standard can often be unclear and depends on clinical site and condition [1,2]. Previous reports have generally studied chronic diseases in outpatient settings [1–3,5,6]. Agreement varies depending on patient population studied, method of charting, specific factor studied, and clinical location [7,8].

To our knowledge, the level of agreement between self-report and the electronic medical record for emergency department (ED) patients has not been addressed. The ED presents a potentially unique environment where patients are in a time-sensitive and stressful situation. Time constraints may prevent emergency physicians from obtaining a complete medical history or conducting a thorough search of medical records. Identifying the presence of an antimicrobial resistance (AR) risk factor has critical importance for ED antibiotic selection [9–12]. Failure to choose an appropriate empiric antibiotic is associated with increased morbidity and mortality [13–16]. In addition, inaccurate documentation of risk factors in the medical record could substantially affect the conclusions of ED chart review studies.

Our overall goal was to identify the agreement between patient self-report and electronic medical record review for presence of AR risk factors in ED patients. We examined specific AR risk factors from several domains including residence in a nursing home, recent health care utilization, presence of indwelling devices, and medical history.

2. Methods

We conducted a cross-sectional analysis of patients presenting to an urban tertiary care hospital ED with 72000 yearly visits from July 2010 through January 2011. All ED patients 18 years or older were eligible. Exclusion criteria included pregnant women, prisoners, altered mental status (dementia or delirium), non-English speakers, patients evaluated by the trauma response team, and lack of patient or proxy ability to give consent or respond to the survey. Recruitment occurred during times when a research assistant was available. Institutional review board approval was obtained.

A convenience sample of patients was enrolled by trained undergraduate research assistants who completed a 1-hour training session. Enrollment occurred on a sample of shifts between 8 AM and midnight when research assistants were available. Patients in the ED during a research shift were eligible for enrollment. A standardized patient survey was verbally administered in the ED (Appendix). Patients reported the presence or absence of AR risk factors, being asked “Do you have or has a doctor ever told you have risk factor” for each. Additional questionnaire data included demographics and medical history. Research assistants obtained yes/no answers and documented “I don’t know” or similar answers as “no.” No prior validation of the instrument was performed.

Three abstractors (LG and 2 research associates) used a standardized form and code book to abstract electronic chart data including demographics, medical history, and AR risk factors.

Abstractors were not blinded to study hypotheses but received a 1-hour training course. The chart review was limited to the most recent: ED visit, inpatient history and physical, primary care office visit, hospital discharge summary, and subspecialty note. Abstractors also reviewed procedure notes from the preceding 3 months. In cases of contradictory evidence, the following hierarchy was followed: procedural/laboratory data, specialist attendant, generalist attendant, emergency attendant, resident, and medical student. Contradictions were considered present in the setting of affirmative statements. Failure to mention a data point was not considered contradictory when another provider documented that data point. Interrater reliability was tested through review of a random sample of 15 charts by the first author (JMC) with κ s.

A risk factor was considered present if answered affirmatively by the patient and if documented as present in any of the chart records reviewed. Antimicrobial resistance risk factors were taken from national guidelines and grouped into 4 domains: demographics, recent health care utilization, current indwelling devices, and medical history (Table) [10,11,17–19]. *Nursing homes* were defined as nursing homes, rehabilitation facilities, and chronic-stay hospitals. Surgical procedures were any procedure taking place in an operating room, excluding office-based or bedside procedures. The exception was recent instrumentation of the genitourinary tract, which was included as an AR risk factor regardless of the procedure occurring in an operating room or at the bedside, consistent with guideline definitions of AR risk factors [19]. Immunosuppression was defined as history of any cancer, HIV or AIDS, multiple myeloma, recent systemic steroid use (>20 mg/d prednisone or equivalent in the past month), immunosuppressive medication use, or organ transplant.

Data analysis was completed using STATA version 12 (STATA Corp, College Station, TX). Descriptive statistics were calculated as number and proportion, mean and SD, or median with interquartile range. In the primary analysis, we identified the difference between patient report and chart review report of having at least 1 risk factor for AR using McNemar's χ^2 test, which accounts for within-patient correlation. The test statistic was also calculated for each individual risk factor. Using Bonferroni's correction for calculation of multiple ($n = 15$) P values, a significant P value was set at $P < .003$. Agreement was calculated using the κ statistic with 95% confidence intervals (CIs) [20].

3. Results

Of 445 subjects screened for enrollment, we excluded 156 (pregnant [$n = 14$], prisoners [7], altered mental status [26], non-English speaking [2], trauma team activation [2], and refused consent [105]), leaving a study population of 289. Interrater reliability demonstrated agreement of 93% ($\kappa = 0.83$) for the presence of at least 1 AR risk factor on chart review. Agreement for each individual risk factor was 93% to 100%.

Median age was 44 years (SD, 17; range, 19–87). Seventy-four percent of subjects were white; 24%, African American; and 2%, Hispanic. As shown in Table, when compared with AR risk factors identified by chart review, patients were more likely to identify presence of at 1 or more AR risk factors ($P < .001$). Sixty-eight percent (95% CI, 63%–74%) of patients

reported the presence of at least 1 risk factor, as compared with 59% (95% CI, 53%–65%) of patients with an identified risk factor on chart review, for a difference of 9.7% (95% CI, 5.3%–14%). Agreement on the presence of 1 or more risk factors were 87%, with κ of 0.72 (95% CI, 0.64–0.80).

The prevalence of many risk factors was higher in the patient self-report data than the chart review data (Table). In the recent health care utilization domain, patients were more likely to report recent antibiotic use (42% vs 29%; $P < .001$) and recent surgery (17% vs 11%; $P < .001$). In other domains, most risk factors were identified by both patient report and chart review in similar proportions. However, in cases where there was some degree of disagreement, patient self-report was more likely to identify the presence of an individual AR risk factor than chart review.

κ Values for recent health care utilization domain factors ranged from 0.77 for recent hospitalization to only 0.52 for recent antibiotics and genitourinary procedure (Table). κ Values for the current indwelling devices domain ranged widely, but low overall prevalence could have affected these values. κ Values demonstrated high levels of agreement for most variables in the medical history domain.

In a secondary analysis, we excluded patients with obvious AR risk factors (those easily identifiable by a clinician through direct visualization on examination) including any current indwelling device, chronic skin infections, or hemodialysis. Results were unchanged from the primary analysis: 61% of patients reported 1 or more AR risk factors, 51% of charts had 1 or more AR risk factors, and κ was 0.71.

4. Discussion

Our goal was to compare ED patient self-report with medical record review in identification of AR risk factors. We found that patient self-report identified the presence of more AR risk factors than chart review, consistent with other authors [4–7,21]. Agreement was greatest for factors concerning medical history and lowest for factors associated with recent health care utilization and presence of indwelling devices. This is consistent with prior studies in which agreement is heavily influenced by characteristics of the individual factors studied [2–8,22].

Elements in the recent health care utilization domain are important factors in development of AR, but several of these factors had poor agreement, including recent antibiotic use and recent surgery. One-sixth of study patients (50/289) reported antibiotic use that was not documented in the chart. One explanation for this discrepancy may be that ED patients have often received care from outside sources, which may not be reflected in the medical record. Alternatively, patients may be inaccurate in their identification of medications received.

Patients were also more likely to self-identify the presence of current indwelling devices. However, low prevalence of these conditions in our population limits conclusions, as percentage agreement and κ values are substantially affected by prevalence. If lack of chart-identified indwelling devices was due to physicians recognizing, but not documenting, their presence, this could affect the results of ED-based chart review studies.

Most items in the medical history domain showed excellent agreement, consistent with past studies of chronic diseases such as diabetes, HIV, and cancer [2,3,6–8,21–24]. Conditions with nonspecific or intermittent symptoms (eg, depression, heart failure) may have worse concordance. Therefore, our conclusions should not extend beyond the conditions examined [2,6,7].

Ultimately, both patient report and chart review may be inaccurate. Inaccurate patient reports could be due to telescoping, lack of health knowledge, age, poor cognitive function, the ED setting itself, and the type of risk factor studied [1,2,6–8,22,23]. Our study suggests that information regarding recent health care utilization and presence of indwelling devices may be particularly lacking in the medical record. This may be due to the fact that events that are more recent or more transient have less time to make it into the medical record. The ED setting itself may contribute to our findings. Less frequent patient-prescriber contact has been associated with decreased accuracy of chart review [23].

Our findings provide guidance for providers in their provision of clinical care in the ED. For certain factors, particularly those associated with recent healthcare utilization, physicians should not rely solely on the chart to identify these relevant risk factors. Others factors such as past medical conditions may appear more reliably in the chart. Clinicians should, therefore, not rely solely on either methods. In cases where both sources of information are not available, clinicians should consider which data they may reliably be receiving.

Our study also has implications for ED clinical research. Although we found high concordance for medical history variables, the medical record failed to identify several patient-reported conditions in the recent health care utilization and chronic indwelling devices domains. Studies collecting these data may require patient self-report to obtain accurate results. This issue would not be alleviated by commonly accepted chart review methods (eg, re-abstraction), which assume the accuracy of the chart itself.

Our first limitation is that there was no criterion standard to determine the accuracy of reports of AR risk factors. In interpreting the data, we erred on the side of assuming identified risk factors were present, regardless of source. This could result in overestimating the prevalence of AR risk factors. Second, some ED patients were interacting with our health system for the first time. It is possible that information on risk factors was contained in the medical record of other institutions. A third limitation concerns the included patient population, which was a convenience sample. As we enrolled a general patient population, emergency physicians may have been less likely to document AR risk factors in uninfected patients. Fourth, this represents data from a single site. Finally, κ statistics may be artificially low in circumstances with low prevalence [25].

In conclusion, there is substantial disagreement between ED patient self-report and medical record review for many AR risk factors. This disagreement should be taken into account both in clinical care and when conducting clinical research in the ED. Patient self-report identifies a greater number of AR risk factors than chart review. When deciding on appropriate antibiotic therapy, chart review should not be used alone to assess for presence

of AR risk factors in ED patients. Further studies are needed to distinguish between the accuracy and usefulness of these 2 methods in ED populations.

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Appendix

Improving identification of risk factors for antimicrobial resistance among elder ED patients.

PATIENT INTERVIEW

Study number:

Medical record number:

Patient name:

Date of visit:

Age: _____ Gender: M F

Race: White Black Asian Other _____

Ethnicity: Hispanic or Latino non-Hispanic or Latino

Symptoms:

- Fever and/or chills
- Altered mental status/confusion
- Shortness of breath

Risk factors for antibiotic resistance (check any that are present):

- Any antibiotic use in the past 3 months
- Any hospitalization for greater than or equal to 2 days in the past 3 months

- Any surgery in the past 90 days
- Any current surgical drains
- Nursing home resident
- Diabetes mellitus
- Cancer
 - Any cancer
 - Metastatic cancer
 - Leukemia
 - Lymphoma
- HIV or AIDS
- Immunosuppression
 - Any cancer (from above)
 - HIV or AIDS (from above)
 - Multiple myeloma
 - Recent steroid use
 - Immunosuppressive medication use
 - Organ transplant
- Indwelling bladder catheter or suprapubic catheter
- Procedure or instrumentation of the genitourinary tract (bladder, urethra or kidney) in the past 30 days
- Chronic, indwelling IV line, catheter, or port
- Chronic skin ulcers/infections
- Receiving hemodialysis

Other past medical history (check any that are present):

- Cardiac
 - Congestive heart failure
 - Myocardial infarction (heart attack)
- Pulmonary
 - Chronic obstructive pulmonary disease (emphysema)
 - Asthma
 - Pneumonia
- Peripheral vascular disease

- Neurologic
 - Stroke or cerebrovascular accident
 - Dementia
 - Hemiplegia (paralysis)
- Connective tissue disease (eg, lupus, rheumatoid arthritis; NOT fibromyalgia)
- Gastrointestinal
 - Peptic ulcer disease
 - Liver disease
 - Liver cirrhosis
- Renal (kidney) disease (including Cr >2)

Improving identification of risk factors for antimicrobial resistance among elder ED patients.

CHART REVIEW

Study number:

Medical record number:

Patient name:

Date of visit:

Symptoms:

- Fever and/or chills
- Altered mental status/confusion
- Shortness of breath

Risk factors for antibiotic resistance (check any that are present):

- Any antibiotic use in the past 3 months
- Any hospitalization for greater than or equal to 2 days in the past 3 months
- Any surgery in the past 90 days
- Any current surgical drains
- Nursing home resident
- Diabetes mellitus
- Cancer
 - Any cancer
 - Metastatic cancer

- Leukemia
 - Lymphoma
- HIV or AIDS
- Immunosuppression
 - Any cancer (from above)
 - HIV or AIDS (from above)
 - Multiple myeloma
 - Recent steroid use
 - Immunosuppressive medication use
 - Organ transplant
- Indwelling bladder catheter or suprapubic catheter
- Procedure or instrumentation of the genitourinary tract (bladder, urethra or kidney) in the past 30 days
- Chronic, indwelling IV line, catheter, or port
- Chronic skin ulcers/infections
- Receiving hemodialysis

Other past medical history (check any that are present):

- Cardiac
 - Congestive heart failure
 - Myocardial infarction (heart attack)
- Pulmonary
 - Chronic obstructive pulmonary disease (emphysema)
 - Asthma
 - Pneumonia
- Peripheral vascular disease
- Neurologic
 - Stroke or cerebrovascular accident
 - Dementia
 - Hemiplegia (paralysis)
- Connective tissue disease (eg, lupus, rheumatoid arthritis; NOT fibromyalgia)
- Gastrointestinal
 - Peptic ulcer disease

- Liver disease
- Liver cirrhosis
- Renal (kidney) disease (including Cr >2)

Initial ED vital signs:

Temperature_____	Pulse_____
Respiratory rate_____	Systolic blood pressure_____
Pulse oxygenation_____on_____ LO ₂	

ED Laboratory Values:

WBC_____	Hemoglobin_____
Platelets_____	Band forms_____
BUN_____	Creatinine_____

Table

Prevalence of and agreement between patient-reported and chart-identified risk factors for antibiotic resistance in 289 ED patients

Risk factors	Presence of at least 1 AR risk factor by patient self-report, n (%)	Presence of at least one AR risk factor by chart review, n (%)	Agreement, n (%)	Disagreement, n (%)	Present by patient report; absent in chart review (n)	Present in chart review; absent by patient report (n)	κ (95% CI)	McNemar's test statistic *
Any risk factor	198 (68%)	170 (59%)	251 (87%)	38 (13%)	33	5	0.72 (0.64–0.80)	<0.001
Demographics								
Nursing home resident, current	9 (3%)	8 (3%)	284 (98%)	5 (2%)	3	2	0.70 (0.44–0.95)	0.65
Recent health care utilization								
Antibiotics in the previous 90 d	120 (42%)	85 (29%)	224 (78%)	65 (22%)	50	15	0.52 (0.42–0.62)	<0.001
Hospitalization, previous 90 d (2 d)	75 (26%)	63 (22%)	265 (92%)	24 (8%)	18	6	0.77 (0.69–0.86)	0.01
Surgery in the past 90 d	49 (17%)	32 (11%)	274 (92%)	25 (8%)	21	4	0.64 (0.52–0.77)	<0.001
Genitourinary procedure, previous 30 d	9 (3%)	6 (2%)	284 (98%)	7 (2%)	5	2	0.52 (0.21–0.83)	0.26
Current indwelling devices								
Indwelling surgical drain present	5 (2%)	2 (1%)	282 (98%)	7 (2%)	4	1	0.27 (–0.16–0.72)	0.18
Central line (chronic) present in the ED	25 (9%)	19 (7%)	275 (95%)	14 (5%)	10	4	0.66 (0.49–0.82)	0.11
Indwelling bladder catheter present	10 (3%)	2 (1%)	279 (96%)	10 (4%)	9	1	0.16 (–0.12–0.44)	0.01
Medical history								
Diabetes mellitus	56 (19%)	61 (21%)	280 (97%)	9 (3%)	2	7	0.90 (0.84–0.96)	0.1
Cancer (current or by history)	52 (18%)	47 (16%)	272 (94%)	17 (6%)	11	6	0.79 (0.69–0.89)	0.22
HIV or AIDS	7 (2%)	8 (3%)	288 (100%)	1 (0%)	0	1	0.93 (0.80–1.00)	0.31
Immunosuppression	90 (31%)	83 (29%)	254 (88%)	35 (12%)	21	14	0.71 (0.62–0.80)	0.24
Chronic skin ulcers or wounds	14 (5%)	9 (3%)	272 (84%)	17 (6%)	11	6	0.23 (–0.01–0.47)	0.22
Hemodialysis	9 (3%)	6 (2%)	286 (99%)	3 (0%)	3	0	0.80 (0.57–1.00)	0.08

* Significant $P < .03$ due to Bonferroni correction for multiple comparisons.