interaction with the criminal justice system. The resultant poverty is a virulent health risk factor for AA men. Our findings at 125% of the poverty line suggest that revision of poverty thresholds triggering eligibility for federal programs that influence quality of life, health, and equal opportunity should take into account premature mortality driven by poverty as a first step to address the vulnerability of poor AA men.

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Medical Student Use of Electronic Health Records to Track Former Patients

Medical students are increasingly using electronic health records (EHRs) in training. One educational application of EHRs involves tracking former patients after they have left one’s direct care.1 By providing longitudinal access to future clinical data, EHRs allow students to audit their diagnostic impressions and observe patient outcomes.2 Despite its potential educational value, to our knowledge, little has been written about tracking former patients, and its prevalence is unknown. Some medical students track patients, but this activity is generally extracurricular and it is unclear why they do it.3 Furthermore, tracking former patients raises ethical questions about the appropriate use of protected health information.1,3

We conducted a survey to estimate the prevalence of tracking former patients by medical students at our institution. Secondary aims were to examine the perceived value of and ethical concerns associated with such tracking.

Methods | We surveyed fourth-year medical students at an academic health center on August 9, 2013. Fourth-year students were selected because they had completed 48 weeks of clinical clerkships in their third year of medical school, giving them time to establish a pattern of EHR use. The survey was administered in paper format at a mandatory class at the start of the academic year. As participation was voluntary and anonymous, the students did not provide consent. No incentives were offered. Students had received no prior guidance on tracking patients via the EHR.

Study supervision: Zonderman, Ejiogu, Evans.
Conflict of Interest Disclosures: None reported.

Funding/Support: The Healthy Aging in Neighborhoods Across the Life Span study is supported by the Intramural Research Program of the National Institute on Aging, National Institutes of Health (NIH) (ZIA-AG000195). Support was also provided by the National Institute on Minority Health and Health Disparities, NIH.

Role of the Funder/Sponsor: The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.


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AA indicates African American.

Figure. Survival Curves Based on the Cox Proportional Hazards Model of Sex, Race, and Poverty Status

<table>
<thead>
<tr>
<th>No. at risk</th>
<th>White above poverty status</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>107</td>
<td>111</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>101</td>
<td>98</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>131</td>
<td>148</td>
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<td>121</td>
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<td>14</td>
<td></td>
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<tr>
<td>76</td>
<td>57</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>43</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>167</td>
<td>123</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>118</td>
<td>94</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

White above poverty status
AA above poverty status
White below poverty status
AA below poverty status

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Survival, Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>0.6</td>
</tr>
<tr>
<td>40</td>
<td>0.8</td>
</tr>
<tr>
<td>50</td>
<td>1.0</td>
</tr>
<tr>
<td>60</td>
<td>0.6</td>
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<tr>
<td>70</td>
<td>0.4</td>
</tr>
<tr>
<td>80</td>
<td>0.2</td>
</tr>
</tbody>
</table>

AA indicates African American.
Results | 95%CIs.

We developed a preliminary, nonvalidated survey consisting of 7 questions about tracking patients and whether it raised any ethical concerns, with space for free-text responses. Questions were informed by a literature review. Approval of the survey was waived by the Northwestern University Feinberg School of Medicine Institutional Review Board. We manually calculated descriptive statistics to estimate proportions and 95% CIs.

Multiple responses were allowed. Error bars demonstrate 95% CIs for each calculated proportion.

*Free-text responses cited research projects and clerkship-related assignments.

Table. How Medical Students Learned to Track Former Patients in the Electronic Health Record

<table>
<thead>
<tr>
<th>Survey Response</th>
<th>No. (%) of Responses [95% CI]a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learned on my own</td>
<td>54 (52.4) [43%-62%]</td>
</tr>
<tr>
<td>Learned from peers</td>
<td>5 (4.9) [1%-9%]</td>
</tr>
<tr>
<td>Learned from upperclassmen</td>
<td>2 (1.9) [0%-5%]</td>
</tr>
<tr>
<td>Learned from housestaff</td>
<td>13 (12.6) [6%-19%]</td>
</tr>
<tr>
<td>Learned from attending physicians</td>
<td>2 (1.9) [0%-5%]</td>
</tr>
<tr>
<td>Otherb</td>
<td>1 (1.0) [0%-3%]</td>
</tr>
<tr>
<td>Multiple influencesc</td>
<td>20 (19.4) [12%-27%]</td>
</tr>
</tbody>
</table>

* Multiple responses were allowed.

b Free-text response cited clerkship-related assignments.

c Proportion of students who selected more than 1 response; the answer was counted for the original category and for “Multiple influences.”

Discussion | Nearly all respondents reported tracking former patients in the EHR. Although we had no data to guide our expectations, this result was surprising, especially since tracking patients occurs in the absence of institutional direction. And while our data are confined to a single institution, evidence suggests that tracking patients occurs at other institutions.1

Less surprising was that nearly all respondents found tracking patients to be educationally beneficial. Tracking demonstrates self-directed learning and curiosity about patient outcomes, qualities that can improve clinical reasoning.4,5

Although these results may be interpreted positively, they do not tell the whole story. Only a few respondents expressed concerns about the ethics of tracking patients, and almost half did not distinguish between tracking for education (to confirm diagnosis or follow treatment) and tracking out of curiosity about patients, an action that may not represent appropriate use of EHRs.6 These results suggest that students may benefit from guidance on tracking former patients in an ethically appropriate manner. There are limitations to this study, including small sample size, lack of a validated survey tool, and potential nonresponse bias even with a response rate of 60.9%.

Results of this survey suggest that tracking patients is a potentially valuable and widely practiced educational activity. However, it is associated with ethical problems that students may not appreciate, and it is unclear how patients view this activity. This topic merits exploration to understand how to optimize tracking for education while protecting patient privacy.

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Author Contributions: Drs Brisson and Tyler had full access to all the data in the study and take full responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Both authors.
Acquisition, analysis, or interpretation of data: Both authors.
Drafting of the manuscript: Both authors.
Critical revision of the manuscript for important intellectual content: Both authors.
Statistical analysis: Both authors.
Administrative, technical, or material support: Tyler.

Conflict of Interest Disclosures: None reported.

Additional Contributions: We thank the members of the Northwestern Memorial Hospital Medical Ethics Committee, in particular Cynthia Barnard, MBA, MSJ, and Kathy Neely, MD, for their guidance and feedback on this topic. They were not compensated for their contribution.


LESS IS MORE
Use of Antibiotics Among Patients Hospitalized for Exacerbations of Asthma

The Centers for Disease Control and Prevention estimates that 37% of all antibiotic use in hospitals may be inappropriate, and reducing unnecessary antibiotic prescribing is now considered an urgent national priority.1,2 In the United States alone, asthma exacerbations led to 1.8 million emergency department visits and 400 000 hospitalizations annually.3 Although guidelines recommend against prescribing antibiotics during exacerbations of asthma in the absence of concurrent infection, little is known about the use of antibiotics in routine clinical practice.4,5

Methods | We conducted a retrospective study of hospitalizations in 2013 and 2014 at 577 US hospitals that participate in the Premier Alliance database. Patients 18 years or older were included if they had a principal diagnosis of asthma (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] codes 493.0x, 493.1x 493.9x 493.2x, 493.8x, and 493.9x) or a principal diagnosis of acute respiratory failure (ICD-9-CM codes 518.81, 518.82, and 518.84) combined with a secondary diagnosis of asthma. We excluded patients with an admitting or discharge diagnosis of bronchitis, emphysema, chronic obstructive pulmonary disease, or bronchiectasis. We also excluded patients with potential indications for antibiotics, including those with admitting or present-on-admission discharge diagnoses of sinusitis, pneumonia, urinary tract infection, skin and soft-tissue infection, sepsis, or fever; those hospitalized for pneumonia within 3 months of the index admission; or those in whom blood or sputum cultures were obtained. The Institutional Review Board at Baystate Medical Center approved the study, which was considered nonhuman subjects research.

For each patient, we assessed receipt, type, and timing of antibiotic therapy. For each hospital, we computed a facility-specific rate of antibiotic treatment. We developed a hierarchical logistic regression model to identify independent patient and hospital factors associated with antibiotic treatment. In a sensitivity analysis, we further restricted the cohort by excluding patients with a diagnosis of infection regardless of present-on-admission status, those 55 years or older, and patients with a diagnosis of tobacco use.

Results | Among 51 951 patients, the median age was 52 years (interquartile range, 39-64 years), 36 527 (70.3%) were female, and 23 728 (45.7%) identified as white (Table). Antibiotics were prescribed on the first hospital day in 21 248 (40.9%) and at any point during the hospitalization in 30 226 patients (58.2%). Median duration of inpatient

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