Immediate and Delayed Traumatic Intracranial Hemorrhage in Patients With Head Trauma and Preinjury Warfarin or Clopidogrel Use

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Study objective: Patients receiving warfarin or clopidogrel are considered at increased risk for traumatic intracranial hemorrhage after blunt head trauma. The prevalence of immediate traumatic intracranial hemorrhage and the cumulative incidence of delayed traumatic intracranial hemorrhage in these patients, however, are unknown. The objective of this study is to address these gaps in knowledge.

Methods: A prospective, observational study at 2 trauma centers and 4 community hospitals enrolled emergency department (ED) patients with blunt head trauma and preinjury warfarin or clopidogrel use from April 2009 through January 2011. Patients were followed for 2 weeks. The prevalence of immediate traumatic intracranial hemorrhage and the cumulative incidence of delayed traumatic intracranial hemorrhage were calculated from patients who received initial cranial computed tomography (CT) scan in the ED. Delayed traumatic intracranial hemorrhage was defined as traumatic intracranial hemorrhage within 2 weeks after an initially normal CT scan result and in the absence of repeated head trauma.

Results: A total of 1,064 patients were enrolled (768 warfarin patients [72.2%] and 296 clopidogrel patients [27.8%]). There were 364 patients (34.2%) from Level I or II trauma centers and 700 patients (65.8%) from community hospitals. One thousand patients received a cranial CT scan in the ED. Both warfarin and clopidogrel groups had similar demographic and clinical characteristics, although concomitant aspirin use was more prevalent among patients receiving clopidogrel. The prevalence of immediate traumatic intracranial hemorrhage was higher in patients receiving clopidogrel (33/276, 12.0%; 95% confidence interval [CI] 8.4% to 16.4%) than patients receiving warfarin (37/724, 5.1%; 95% CI 3.6% to 7.0%), relative risk 2.31 (95% CI 1.48 to 3.63). Delayed traumatic intracranial hemorrhage was identified in 4 of 687 (0.6%; 95% CI 0.2% to 1.5%) patients receiving warfarin and 0 of 243 (0%; 95% CI 0% to 1.5%) patients receiving clopidogrel.

Conclusion: Although there may be unmeasured confounders that limit intergroup comparison, patients receiving clopidogrel have a significantly higher prevalence of immediate traumatic intracranial hemorrhage compared with patients receiving warfarin. Delayed traumatic intracranial hemorrhage is rare and occurred only in patients receiving warfarin. Discharging patients receiving anticoagulant or antiplatelet medications from the ED after a normal cranial CT scan result is reasonable, but appropriate instructions are required because delayed traumatic intracranial hemorrhage may occur. [Ann Emerg Med. 2012;59:460-468.]

Please see page 461 for the Editor’s Capsule Summary of this article.
Immediate and Delayed Intracranial Hemorrhage

Editor’s Capsule Summary

What is already known on this topic
Anticoagulant and antiplatelet drugs increase the risk for traumatic intracranial hemorrhage after blunt head trauma.

What question this study addressed
What is the incidence and prevalence of immediate and delayed traumatic intracranial hemorrhage in patients with blunt head trauma who are receiving clopidogrel and warfarin?

What this study adds to our knowledge
In this prospective observational multicenter study of 1,064 patients, the prevalence of immediate traumatic intracranial hemorrhage was 12% for patients receiving clopidogrel and 5.1% for those receiving warfarin. Delayed traumatic intracranial hemorrhage was 0% and 0.6%, respectively.

How this is relevant to clinical practice
In blunt head trauma, patients receiving clopidogrel may be at greater risk of immediate traumatic intracranial hemorrhage than those receiving warfarin. Delayed traumatic intracranial hemorrhage is rare and it may be reasonable to discharge a patient after a normal head CT scan result.

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INTRODUCTION

Background
The use of anticoagulant and antiplatelet medications, specifically warfarin and clopidogrel, is steadily increasing.1-3 Previous studies suggest that patients receiving either of these medications are at increased risk for traumatic intracranial hemorrhage after blunt head trauma, but the risk in a large, generalizable cohort is unknown.4,6

Importance
The majority of patients with traumatic intracranial hemorrhage are identified on initial cranial computed tomographic (CT) scan. Limited data, however, suggest that patients receiving warfarin are at increased risk for delayed traumatic intracranial hemorrhage (traumatic intracranial hemorrhage diagnosed within 2 weeks of injury after an initially normal cranial CT scan result).7-9 The concern for delayed traumatic intracranial hemorrhage is highlighted by the not uncommon practice of reversing warfarin anticoagulation in patients with head trauma and a normal cranial CT scan result.10 The potential risk for both immediate and delayed traumatic intracranial hemorrhage has generated guidelines recommending routine cranial CT imaging and hospital admission for neurologic observation in head-injured patients receiving warfarin.11-13 These recommendations, however, are not informed by rigorous, prospective, multicenter studies identifying the prevalence and incidence of immediate traumatic intracranial hemorrhage and delayed traumatic intracranial hemorrhage in patients receiving warfarin.

The evidence supporting an increased risk of traumatic intracranial hemorrhage in patients receiving clopidogrel is more limited,11 despite this drug being one of the most commonly prescribed worldwide.15 Although small retrospective studies suggest an increased risk of traumatic intracranial hemorrhage and mortality in head trauma patients receiving clopidogrel,6,16,17 current guidelines do not explicitly recommend routine CT imaging for these patients after blunt head trauma.11-13 In addition, the risk of delayed traumatic intracranial hemorrhage in patients receiving clopidogrel is entirely unknown.

Goals of This Investigation
Knowledge of the true prevalence and incidence of immediate and delayed traumatic intracranial hemorrhage in patients receiving warfarin or clopidogrel would allow clinicians to make evidence-based decisions about their initial patient evaluation and disposition. Therefore, we assessed the prevalence and incidence of immediate and delayed traumatic intracranial hemorrhage in patients with blunt head trauma who were receiving either warfarin or clopidogrel. Warfarin and clopidogrel cohorts were compared. We hypothesized that the prevalence for immediate traumatic intracranial hemorrhage was similar between patients receiving clopidogrel and those receiving warfarin and that the cumulative incidence of delayed traumatic intracranial hemorrhage in both groups was less than 1%.

MATERIALS AND METHODS

Study Design
This was a prospective, observational, multicenter study conducted at 2 trauma centers and 4 community hospitals in Northern California. The study was approved by the institutional review boards at all sites.

Setting and Selection of Participants
Adult (aged ≥18 years) emergency department (ED) patients with blunt head trauma and preinjury warfarin or clopidogrel use (within the previous 7 days) were enrolled. We defined blunt head trauma as any blunt head injury regardless of loss of consciousness or amnesia. We excluded patients with known injuries who were transferred from outside facilities because their inclusion would falsely inflate the prevalence of traumatic intracranial hemorrhage. Additionally, patients with concomitant warfarin and clopidogrel use were excluded.

Data Collection and Processing
The treating ED faculty physicians recorded patient history and medication use, injury mechanism, and clinical examination,
including initial Glasgow Coma Scale score (GCS) and evidence of trauma above the clavicles (defined as trauma to the face, neck, or scalp) on a standardized data form (Appendix E1–E4, available online at http://www.annemergmed.com) before cranial CT (if obtained). Imaging studies were obtained at the discretion of the treating physician and not dictated by study protocol. At each site, approximately 10% of patients (nonrandomly selected) had a separate, independent faculty physician assessment that was masked and completed within 60 minutes of the initial assessment to evaluate the reliability of preselected clinical variables. Data on patients eligible but not enrolled (failures of the study screening process) during ED evaluation were abstracted from their medical records to assess for enrollment bias.

Outcome Measures

Immediate traumatic intracranial hemorrhage was defined as the presence of any intracranial hemorrhage or contusion as interpreted by the faculty radiologist on the initial cranial CT scan. Patients without a cranial CT scan during initial ED evaluation were excluded from the immediate traumatic intracranial hemorrhage calculation. Delayed traumatic intracranial hemorrhage was defined as traumatic intracranial hemorrhage on cranial CT scan, occurring within 14 days after an initial normal CT scan result and in the absence of repeated head trauma. Neurosurgical intervention was defined as the use of intracranial pressure monitor or brain tissue oxygen probe, placement of a burr hole, craniotomy/craniectomy, intraventricular catheter or subdural drain, or the use of mannitol or hypertonic saline solution.

Patients were admitted to the hospital at the discretion of the emergency physician. Patients with normal cranial CT scan results and therapeutic international normalized ratio levels are not reversed at the participating centers. Electronic medical records were reviewed in a standardized fashion by research coordinators and site investigators to assess international normalized ratio results, CT scan results, ED disposition, and hospital course. Patients admitted to the hospital for at least 14 days were evaluated for the presence of delayed traumatic intracranial hemorrhage through review of the electronic medical record. Patients discharged from the ED or admitted to the hospital for fewer than 14 days received a consented, standardized telephone survey at least 14 days after the ED or admitted to the hospital for fewer than 14 days received a 14-day follow-up was deemed sufficient to evaluate the reliability of preselected clinical variables. Data on patients enrolled and those eligible but not enrolled demonstrated similar characteristics (age, sex, medication use, ED cranial CT, and hospital admission) and outcomes (immediate traumatic intracranial hemorrhage, neurosurgical intervention, and in-hospital mortality). Reasons for failures of the study screening process were unknown.

Thirty-seven patients were excluded (25 transferred patients and 12 patients with concomitant clopidogrel and warfarin use), leaving 1,064 patients for data analysis. Of the 1,064 patients, 768 patients (72.2%) were receiving warfarin and 296 patients (27.8%) were receiving clopidogrel. There were 364 patients (34.2%) from 2 designated Level I or II trauma centers and 700 patients (65.8%) from 4 community hospitals. The most common mechanism of injury was a ground-level fall (n = 887; 83.3%) followed by direct blow (n = 59; 5.6%) and motor vehicle crash (n = 51; 4.8%).

The majority (n = 932; 87.6%) of patients had a GCS score of 15, and 752 (70.7%) patients had physical examination findings of head trauma above the clavicles. The primary indication for warfarin and clopidogrel use was atrial fibrillation (543/768; 70.7%) and coronary artery disease (158/296; 53.4%), respectively. Most patients reported receiving their medication less than 24 hours before injury (warfarin group 660/768, 85.9%; clopidogrel group 252/296, 85.1%). In patients receiving warfarin, 603 of 768 (78.5%) had an international normalized ratio measurement on initial evaluation in the ED (median international normalized ratio 2.5; interquartile range 2.0 to 3.3). The majority of these patients (576/603; 95.5%) had an elevated international normalized ratio (≥1.3), and 458 of 603 (76.0%) had an international normalized ratio (≥2.0).

One thousand of the 1,064 (94.0%; 95% CI 92.4% to 95.3%) received a cranial CT during initial ED evaluation. Hospitalization rates were similar for patients receiving warfarin (271/768; 35.3%) and clopidogrel (93/296; 31.4%). Patient clinical characteristics were similar in both groups, except for headache, concomitant aspirin use,
and evidence of trauma to the neck and scalp laceration, which were more common in the clopidogrel group (Table 1).

**Main Results**

Seventy of the 1,000 patients had immediate traumatic intracranial hemorrhage on ED CT scan. The prevalence of immediate traumatic intracranial hemorrhage was higher in patients receiving clopidogrel (33/276; 12.0%; 95% CI 8.4% to 16.4%) than warfarin (37/724, 5.1%, 95% CI 3.6% to 7.0%; relative risk = 2.31, 95% CI 1.48 to 3.63; \(P<.001\)) (Table 2). Follow-up was obtained for 63 of 64 of patients not undergoing cranial CT during initial ED evaluation, and none subsequently received a diagnosis of traumatic intracranial hemorrhage. Mortality and neurosurgical intervention rates after immediate traumatic intracranial hemorrhage were not statistically different between cohorts (Table 2).

The majority of patients with immediate traumatic intracranial hemorrhage (45/70; 64.3%) had a normal mental status (GCS score = 15), with similar proportions between the warfarin (23/37; 62.2%) and clopidogrel (22/33; 66.7%) cohorts. Furthermore, in patients with immediate traumatic intracranial hemorrhage, 4 of 37 (10.8%) in the warfarin cohort and 6 of 33 (18.2%) in the clopidogrel cohort had no loss of consciousness, a normal mental status, and no evidence of trauma above the clavicles.

The prevalence of immediate traumatic intracranial hemorrhage varied by participating center. The prevalence of traumatic intracranial hemorrhage was highest at the Level I trauma center (12.6%; 95% CI 8.1% to 18.3%) compared with the Level II trauma center (5.0%; 95% CI 2.3% to 9.2%) and the 4 community centers (5.4%; 95% CI 3.9% to 7.4%). All clinical
Table 1. Demographic and clinical characteristics of the study population.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total (n=1,064)</th>
<th>Warfarin (n=768)</th>
<th>Clopidogrel (n=296)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>75.4 (12.7)</td>
<td>75.3 (13.0)</td>
<td>75.7 (11.9)</td>
</tr>
<tr>
<td>Male sex</td>
<td>502 (47.1)</td>
<td>362 (47.1)</td>
<td>140 (47.3)</td>
</tr>
<tr>
<td><strong>Mechanism of injury</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground-level fall</td>
<td>887 (83.3)</td>
<td>644 (83.9)</td>
<td>243 (82.1)</td>
</tr>
<tr>
<td>Fall from height</td>
<td>37 (3.5)</td>
<td>23 (3.0)</td>
<td>14 (4.7)</td>
</tr>
<tr>
<td>MVC, &lt;35 miles/h</td>
<td>18 (1.7)</td>
<td>12 (1.6)</td>
<td>6 (2.0)</td>
</tr>
<tr>
<td>MVC, ≥35 miles/h</td>
<td>24 (2.3)</td>
<td>16 (2.1)</td>
<td>8 (2.7)</td>
</tr>
<tr>
<td>MCV, unknown speed</td>
<td>9 (0.8)</td>
<td>4 (0.5)</td>
<td>5 (1.7)</td>
</tr>
<tr>
<td>Pedestrian struck by automobile</td>
<td>4 (0.4)</td>
<td>4 (0.5)</td>
<td>0</td>
</tr>
<tr>
<td>Bicyclist struck by automobile</td>
<td>4 (0.4)</td>
<td>3 (0.4)</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>Direct blow</td>
<td>59 (5.6)</td>
<td>45 (5.9)</td>
<td>14 (4.7)</td>
</tr>
<tr>
<td><strong>Clinical history</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td>45 (4.2)</td>
<td>34 (4.4)</td>
<td>11 (3.7)</td>
</tr>
<tr>
<td>Headache</td>
<td>357 (33.6)</td>
<td>239 (31.1)</td>
<td>118 (39.9)</td>
</tr>
<tr>
<td>Loss of consciousness or amnesia</td>
<td>196 (18.4)</td>
<td>136 (17.7)</td>
<td>60 (20.3)</td>
</tr>
<tr>
<td>Concomitant aspirin use</td>
<td>43 (4.0)</td>
<td>19 (2.5)</td>
<td>24 (8.1)</td>
</tr>
<tr>
<td><strong>Physical examination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol intoxication</td>
<td>33 (3.1)</td>
<td>26 (3.4)</td>
<td>7 (2.4)</td>
</tr>
<tr>
<td><strong>Any evidence of trauma above the clavicles</strong></td>
<td>752 (70.7)</td>
<td>531 (69.1)</td>
<td>221 (74.7)</td>
</tr>
<tr>
<td>Trauma to face</td>
<td>406 (38.2)</td>
<td>296 (38.5)</td>
<td>110 (37.2)</td>
</tr>
<tr>
<td>Trauma to neck</td>
<td>36 (3.4)</td>
<td>20 (2.6)</td>
<td>16 (5.4)</td>
</tr>
<tr>
<td>Basilar skull fracture</td>
<td>2 (0.2)</td>
<td>1 (0.1)</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>Scalp abrasion</td>
<td>157 (14.8)</td>
<td>110 (14.3)</td>
<td>47 (15.9)</td>
</tr>
<tr>
<td>Scalp contusion</td>
<td>309 (29.0)</td>
<td>221 (28.8)</td>
<td>88 (29.7)</td>
</tr>
<tr>
<td>Scalp laceration</td>
<td>182 (17.1)</td>
<td>117 (15.2)</td>
<td>65 (22.0)</td>
</tr>
<tr>
<td>Normal mental status (GCS score 15)</td>
<td>932 (87.6)</td>
<td>674 (87.8)</td>
<td>258 (87.2)</td>
</tr>
<tr>
<td>Mild head injury (GCS score 13–15)</td>
<td>1035 (97.3)</td>
<td>747 (97.3)</td>
<td>288 (97.3)</td>
</tr>
<tr>
<td>Moderate head injury (GCS score 9–12)</td>
<td>18 (1.7)</td>
<td>13 (1.7)</td>
<td>5 (1.7)</td>
</tr>
<tr>
<td>Severe head injury (GCS score 3–8)</td>
<td>11 (1.0)</td>
<td>8 (1.0)</td>
<td>3 (1.0)</td>
</tr>
<tr>
<td><strong>ED course</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial cranial CT</td>
<td>1000 (94.0)</td>
<td>724 (94.3)</td>
<td>276 (93.3)</td>
</tr>
<tr>
<td>Admitted to hospital</td>
<td>364 (34.2)</td>
<td>271 (35.3)</td>
<td>93 (31.4)</td>
</tr>
</tbody>
</table>

variables measured for interrater reliability had substantial agreement (range 87% to 100%).21

The cumulative incidence of delayed traumatic intracranial hemorrhage was assessed in the 930 patients with an initial normal cranial CT scan by telephone survey (843; 90.6%) or electronic medical record review (83; 8.9%). Of the 4 patients lost to follow-up, none was identified in the Social Security Death Index.

Delayed traumatic intracranial hemorrhage was identified in 4 of 687 (0.6%; 95% CI 0.2% to 1.5%) patients receiving warfarin and 0 of 243 (0%; 95% CI 0% to 1.5%) patients receiving clopidogrel (Figure). Two of these 4 patients were deemed nonoperable and died from extensive traumatic intracranial hemorrhage. The characteristics of the 4 patients who experienced a delayed traumatic intracranial hemorrhage are represented in Table 3. One additional patient receiving clopidogrel died at home from unknown causes 8 days after initial ED visit and did not present to hospital at time of death.

Sensitivity Analyses

We performed both stratified and sensitivity analyses to assess the validity of our results (Table 4). The stratified analyses confirm an increased risk of immediate traumatic intracranial hemorrhage in those patients receiving clopidogrel compared with warfarin across all strata. Likewise, the sensitivity analyses also confirm the increased risk of traumatic intracranial hemorrhage in patients receiving clopidogrel.

The final sensitivity analysis assessed the 4 patients lost to follow-up and the 1 death from unknown causes. Assuming all patients had a delayed traumatic intracranial hemorrhage, its cumulative incidence would increase to 6 of 687 patients (0.9%; 95% CI 0.3% to 1.9%) in the warfarin group and 3 of 243 (1.2%; 95% CI 0.3% to 3.6%) in the clopidogrel group.

LIMITATIONS

Our results should be interpreted in the context of several limitations. This was an observational study; thus, CT scans were not obtained for all patients and ethical considerations prevented CT scanning solely for study purposes. Some patients not undergoing CT scan during initial ED visit potentially had an undiagnosed traumatic intracranial hemorrhage, although none was identified in follow-up. Furthermore, some patients with a negative initial CT scan result may have eventually developed an undiagnosed delayed traumatic intracranial hemorrhage. We did, however, obtain clinical follow-up, which is a reasonable method to evaluate for clinically important outcomes when the definitive test is not ethical or feasible.22

The increased risk of immediate traumatic intracranial hemorrhage in the clopidogrel cohort may be attributed to the higher prevalence of concomitant aspirin use compared with the warfarin cohort (8.1% versus 2.5%). However, we conducted a subgroup analysis excluding patients with concomitant aspirin use, and the clopidogrel cohort maintained a significant increased risk for immediate traumatic intracranial hemorrhage compared with the warfarin cohort. We did not collect data on patients with isolated preinjury aspirin use23 or patients without preinjury antplatelet or anticoagulation use. Finally, patients receiving warfarin may be more acutely aware of the bleeding risks associated with their medication than those receiving clopidogrel. Therefore, patients receiving warfarin may be more apt to seek emergency care, even with trivial head trauma, and thus have less severe mechanisms of injury compared with patients receiving clopidogrel. We were unable, however, to identify such behavior because the clinical characteristics, mechanism of injury, and CT scan rate were similar overall between the warfarin and clopidogrel groups.
Immediate and Delayed Intracranial Hemorrhage

Table 2. Prevalence of traumatic intracranial hemorrhage, neurosurgical intervention, and mortality.

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>Patients, No. (%) [95% CI]</th>
<th>Differences in Proportions, % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate tICH*</td>
<td>Total (n=1,064)</td>
<td>Warfarin (n=768)</td>
</tr>
<tr>
<td>Inhospital mortality after immediate tICH</td>
<td>70/1,000 (7.0) [5.5 to 8.8]</td>
<td>37/724 (5.1) [3.6 to 7.0]</td>
</tr>
<tr>
<td>Neurosurgical intervention after immediate tICH</td>
<td>12/70 (17.1) [9.2 to 28.0]</td>
<td>5/37 (13.5) [4.5 to 28.8]</td>
</tr>
<tr>
<td>Delayed tICH†</td>
<td>4/930 (0.4) [0.1 to 1.1]</td>
<td>4/687 (0.6) [0.2 to 1.5]</td>
</tr>
</tbody>
</table>

*Immediate tICH is defined as the presence of tICH on initial cranial CT.
†Delayed tICH is defined as the presence of tICH on cranial CT or autopsy after negative initial cranial CT result without new head trauma.
‡Four patients were lost to follow-up (2 warfarin and 2 clopidogrel) and 1 patient died after discharge from the ED (clopidogrel).

DISCUSSION

Contrary to our hypothesis, the prevalence of immediate traumatic intracranial hemorrhage in patients with clopidogrel was significantly higher compared with those receiving warfarin despite the cohorts’ having similar characteristics. Additionally, we determined in a large and generalizable cohort of patients receiving warfarin or clopidogrel that the development of a delayed traumatic intracranial hemorrhage after a negative initial cranial CT scan result is rare and does not warrant routine hospitalization for observation or immediate anticoagulation reversal with blood products.

To our knowledge, this is the first large, prospective study of head-injured patients with preinjury warfarin or clopidogrel use. We identified 10 warfarin and 3 clopidogrel studies that reported a prevalence of immediate traumatic intracranial hemorrhage.4,6,24-32 The prevalence for immediate traumatic intracranial hemorrhage in patients with preinjury warfarin use ranged from 0% to 65%.4,24-32 The 3 studies evaluating immediate traumatic intracranial hemorrhage in patients with preinjury clopidogrel use demonstrated a prevalence of traumatic intracranial hemorrhage ranging from 36% to 71%.4,25,26 The overall quality of these studies, however, was limited because the majority were small (<100 patients), retrospective registry studies. These studies suffered from significant inclusion bias because the sampled population originated from a trauma registry (patients admitted to a trauma center) and excluded not only patients evaluated and discharged from the trauma center ED but also all patients evaluated at community hospitals. In addition, the prevalence of traumatic intracranial hemorrhage was likely falsely elevated because of the...
Assume patients without cranial CT imaging had immediate tICH

<table>
<thead>
<tr>
<th>Analyses *</th>
<th>Patients, No. (%) [95% CI]</th>
<th>Differences in Proportions, % (95% CI)</th>
<th>Relative Risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary analysis</td>
<td>37/724 (5.1) [3.6 to 7.0]</td>
<td>33/276 (12.0) [8.4 to 16.3]</td>
<td>6.8 (2.7 to 11.0)</td>
</tr>
<tr>
<td>Patients 65 y or older</td>
<td>33/594 (5.6) [3.9 to 7.7]</td>
<td>24/217 (11.1) [7.2 to 16.0]</td>
<td>5.5 (3.7 to 7.4)</td>
</tr>
<tr>
<td>Patients with GCS score 13–15</td>
<td>30/703 (4.3) [2.9 to 6.0]</td>
<td>29/268 (10.8) [7.4 to 15.2]</td>
<td>6.6 (2.5 to 10.6)</td>
</tr>
<tr>
<td>Patients with ground-level fall</td>
<td>23/631 (3.6) [2.3 to 5.4]</td>
<td>22/239 (9.2) [5.9 to 13.6]</td>
<td>5.62 (2.2 to 9.5)</td>
</tr>
<tr>
<td>Patients with evidence of trauma above the clavicles</td>
<td>30/608 (4.9) [3.4 to 7.0]</td>
<td>27/225 (12.0) [8.1 to 17.0]</td>
<td>7.1 (2.5 to 11.6)</td>
</tr>
<tr>
<td>Patients without concomitant aspirin use</td>
<td>29/502 (5.7) [3.9 to 8.2]</td>
<td>21/205 (10.2) [6.4 to 15.2]</td>
<td>4.5 (−0.2 to 9.1)</td>
</tr>
<tr>
<td>Patients evaluated at community hospitals</td>
<td>36/705 (5.1) [3.6 to 7.0]</td>
<td>29/252 (11.5) [7.8 to 16.1]</td>
<td>6.4 (2.1 to 10.7)</td>
</tr>
<tr>
<td>Warfarin patients with INR ≥1.3</td>
<td>35/556 (6.3) [4.4 to 8.6]</td>
<td>33/276 (12.0) [8.4 to 16.3]</td>
<td>5.7 (1.3 to 10.0)</td>
</tr>
<tr>
<td>Warfarin patients with INR ≥2.0</td>
<td>31/441 (7.0) [4.8 to 9.8]</td>
<td>33/276 (12.0) [8.4 to 16.3]</td>
<td>4.9 (0.4 to 9.4)</td>
</tr>
<tr>
<td>Assume patients without cranial CT imaging did not have immediate tICH</td>
<td>37/768 (4.8) [3.4 to 6.6]</td>
<td>33/296 (11.1) [7.8 to 15.3]</td>
<td>6.3 (2.4 to 10.2)</td>
</tr>
<tr>
<td>Assume patients without cranial CT imaging had immediate tICH</td>
<td>81/768 (10.5) [8.5 to 12.9]</td>
<td>53/296 (17.9) [13.7 to 22.8]</td>
<td>7.4 (2.5 to 12.2)</td>
</tr>
</tbody>
</table>

*Based on patients who received a cranial CT scan on initial evaluation after head injury.

The prevalence of immediate traumatic intracranial hemorrhage in well-appearing patients is also very concerning. More than 60% of patients with immediate traumatic intracranial hemorrhage in both warfarin and clopidogrel cohorts had a normal mental status (GCS score = 15). Additionally, a significant proportion of patients (11% in the warfarin cohort and 18% in the clopidogrel cohort) had no loss of consciousness, a normal mental status, and no physical evidence of trauma above the clavicles. Current National Institute for Health and Clinical Excellence head injury guidelines (updated 2007) recommend urgent (<1 hour) CT imaging in patients with head injury and preinjury warfarin use, provided they sustain loss of consciousness or amnesia. In our study, 49 of 70 (70%) patients with immediate traumatic intracranial hemorrhage did not sustain loss of consciousness or amnesia. We recommend routine urgent CT imaging in head-injured patients with previous warfarin or clopidogrel use, even in well-appearing patients without a history of loss of consciousness or amnesia.

The concern for delayed traumatic intracranial hemorrhage in patients with warfarin use stems from case reports and case series, leading guidelines to recommend routine admission for all head-injured patients receiving warfarin despite a normal cranial CT scan result. Moreover, a survey of clinical practices among North American trauma surgeons indicated that 74% of respondents reverse patients receiving warfarin who have blunt head trauma despite a normal cranial CT scan result. Furthermore, 66% of respondents reverse these patients with fresh frozen plasma. Our results indicate that delayed traumatic intracranial hemorrhage occurs infrequently (<1%) in both populations. Thus, patients receiving warfarin or clopidogrel who have a normal cranial CT scan result and no other indications for admission may be discharged home, albeit...
with explicit discharge instructions and close follow-up. More important, these patients do not need to have their therapeutic anticoagulation aggressively reversed with blood products. In patients with supratherapeutic international normalized ratio levels, we recommend appropriate medical treatment following current guidelines.40

In summary, ED patients with blunt head trauma and preinjury clopidogrel use have a significantly higher prevalence of immediate traumatic intracranial hemorrhage compared with those with preinjury warfarin use. Routine cranial CT imaging is generally indicated in patients with blunt head trauma who are receiving clopidogrel or warfarin, regardless of the clinical findings. The cumulative incidence of delayed traumatic intracranial hemorrhage is very low for both groups, suggesting that in patients with a normal cranial CT scan result, anticoagulation reversal is unnecessary and discharging them home from the ED may be reasonable. Because delayed traumatic intracranial hemorrhage may rarely occur, routine follow-up and appropriate discharge instructions are necessary.

Supervising editor: Robert A. De Lorenzo, MD, MSM

Author contributions: DKN had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. DKN, ASR, and JFH conducted the analysis and interpretation of data. All authors contributed to the study conception and design, acquisition of data, drafting and critical revision of the article, obtaining funding, and approval of the final article. DKN takes responsibility for the paper as a whole.

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The views expressed in this article are solely the responsibility of the authors and do not necessarily represent the official view of NCRR, NIH, or Kaiser Permanente. Information on the NCRR is available at http://www.ncrr.nih.gov/. Information on Re-engineering the Clinical Research Enterprise can be obtained from http://nihroadmap.nih.gov/clinicalresearch/overview-translational.asp.

Address for correspondence: Daniel K. Nishijima, MD, MAS, E-mail daniel.nishijima@ucdmc.ucdavis.edu.

REFERENCES

IMAGES IN EMERGENCY MEDICINE
(continued from p. 456)

DIAGNOSIS:

Traumatic mydriasis with hyphema. In blunt ocular trauma, the anterior chamber is compressed, forcefully dilating the pupil. This can injure the iris sphincter, dilator muscles, or nerves of the ciliary plexus to form a traumatic mydriasis, which manifests as a moderately dilated pupil with diminished accommodation and reactivity. Visual acuity can be normal or impaired, and intraocular pressure may range from low to high. Treatment with ophthalmic cycloplegics is typically initially used to relax the iris and ciliary body in this often permanent defect.

Like traumatic mydriasis, hyphemas may herald significant intraocular injuries. This patient was found to have an associated cyclodialysis—a tear between the uveal tissue and sclera commonly caused by blunt ocular trauma, which allows additional flow of aqueous humor from the anterior segment into the suprachoroidal space.

REFERENCES
### APPENDIX E1. Data collection form for the emergency department.

#### Coumadin/Plavix Head Trauma Study v.7.30.09

**Patient Stamp Here:**

- If no patient stamp:
  - NAME: _______________________
  - MRN: _______________________

#### Coumadin/Plavix Head Trauma Study v.7.30.09

<table>
<thead>
<tr>
<th>Trauma Code:</th>
<th>911</th>
<th>922</th>
<th>933</th>
<th>no code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of ED arrival:</td>
<td>/</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time of arrival:</td>
<td>AM</td>
<td>PM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date of injury:</td>
<td>/</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time of injury:</td>
<td>AM</td>
<td>PM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Date of ED arrival:** __/___/___

<table>
<thead>
<tr>
<th>Mode of arrival:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private car</td>
</tr>
<tr>
<td>Ambulance</td>
</tr>
</tbody>
</table>

**Time of injury:** __/___/___  ___:___

### Reported Med(s):

<table>
<thead>
<tr>
<th>Drug</th>
<th>Last dose?</th>
<th>24-48 hrs</th>
<th>48-72 hrs</th>
<th>3-7 days</th>
<th>&gt;7 days</th>
<th>unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>warfarin/coumadin</td>
<td>within 24 hrs</td>
<td>48-72 hrs</td>
<td>3-7 days</td>
<td>&gt;7 days</td>
<td>unknown</td>
<td></td>
</tr>
<tr>
<td>clopidogrel/plavix</td>
<td>within 24 hrs</td>
<td>48-72 hrs</td>
<td>3-7 days</td>
<td>&gt;7 days</td>
<td>unknown</td>
<td></td>
</tr>
<tr>
<td>aspirin</td>
<td>within 24 hrs</td>
<td>48-72 hrs</td>
<td>3-7 days</td>
<td>&gt;7 days</td>
<td>unknown</td>
<td></td>
</tr>
</tbody>
</table>

**Why is patient taking coumadin/warfarin?**

- atrial fibrillation (heart arrhythmia)
- DVT or PE
- heart valve replacement
- in-dwelling catheter
- other
- unknown

**Why is patient taking clopidogrel?**

- coronary artery disease (CAD)
- stroke (CVA)
- peripheral artery disease (PAD)
- other
- unknown

**Mechanism of injury:**

- fall from standing height or less
- fall from greater than standing height
- direct blow to head
- MVA > 35 MPH
- MVA ≤ 35 MPH
- pedestrian vs. auto
- bicyclist vs. auto
- other mechanism

**Evidence of head trauma (trauma above the clavicles)?**

1. Is there trauma to face?  [Yes]  [No]
2. Is there trauma to neck?  [Yes]  [No]
3. Is there trauma to scalp (from above eyebrows to the occiput)?
   - depressed skull fracture
   - abrasion
   - none
   - all other mechanism____________________

**Initial GCS in ED (please fill out):**

<table>
<thead>
<tr>
<th>Eye</th>
<th>Verbal</th>
<th>Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Spontaneous</td>
<td>5 Oriented</td>
<td>6 Follow commands</td>
</tr>
<tr>
<td>3 Verbal</td>
<td>4 Confused</td>
<td>5 Localizes pain</td>
</tr>
<tr>
<td>2 Pain</td>
<td>3 Inappropriate words</td>
<td>4 Withdraws to pain</td>
</tr>
<tr>
<td>1 None</td>
<td>2 Incomprehensible sounds</td>
<td>3 Abnormal flexure posturing</td>
</tr>
<tr>
<td>1 None</td>
<td>2 Abnormal extension posturing</td>
<td>1 None</td>
</tr>
</tbody>
</table>

**A. Has the patient vomited?**  [Yes]  [No]  [Unknown]

<table>
<thead>
<tr>
<th>Eye</th>
<th>Verbal</th>
<th>Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Spontaneous</td>
<td>5 Oriented</td>
<td>6 Follow commands</td>
</tr>
<tr>
<td>3 Verbal</td>
<td>4 Confused</td>
<td>5 Localizes pain</td>
</tr>
<tr>
<td>2 Pain</td>
<td>3 Inappropriate words</td>
<td>4 Withdraws to pain</td>
</tr>
<tr>
<td>1 None</td>
<td>2 Incomprehensible sounds</td>
<td>3 Abnormal flexure posturing</td>
</tr>
<tr>
<td>1 None</td>
<td>2 Abnormal extension posturing</td>
<td>1 None</td>
</tr>
</tbody>
</table>

**GESTALT BOX (PLEASE HAVE ANY OF FOLLOWING FILL OUT):**

1. Clinical suspicion for the presence of intracranial hemorrhage on CT (regardless of whether a CT was obtained):
   - >1%
   - 1-5%
   - 6-10%
   - 11-50%
   - >50%

2. Clinical suspicion for intracranial hemorrhage requiring neurosurgery (regardless of whether a CT was obtained):
   - >1%
   - 1-5%
   - 6-10%
   - 11-50%
   - >50%

3. Were these two questions completed prior to knowledge of CT results?
   - Yes
   - No

PLEASE PLACE COMPLETED FORM IN MARKED FOLDER IN EMR ROOM!!!
APPENDIX E2. Data collection form for follow-up.

**Study ID:** ___________

**MRN:** ____________________

**Name of Patient:** ____________________

**Disposition from ED:**
- □ home/care facility
- □ ICU
- □ floor/telemetry
- □ AMA
- □ Transfer
- □ immitch
- □ delayedich
- □ died2wksdcED
- □ died2wksdcall
- □ all mort

**Directions:**
*For patients discharged from ED or admitted to hospital: Fill out page 1-2*
*For patients with intracranial hemorrhage: Fill out all pages*

***ND= not documented***

**Patient information:**

Age (at time of arrival): ________  □ ND  Gender: □ Male  □ Female

DC date from hospital: __ / ____ / ____  □ ND  □ DC home  LOS: _____ Days

**Initial CT HEAD:**
- Date: ___ / ____ / _________
- *may be from outside hospital*
  - □ initial CT from outside hospital
  - □ initial CT not from outside hospital
  - □ normal head CT
  - □ abnormal head CT
    - Skull fracture: □ unknown or none □ yes
    - SDH: □ unknown or none □ yes
    - EDH: □ unknown or none □ yes
    - IPH: □ unknown or none □ yes
    - IVH: □ unknown or none □ yes
    - SAH: □ unknown or none □ yes
    - Shift: □ unknown or none □ yes
    - Herniation: □ unknown or none □ yes

*1 = normal CT, 2 = no mass > 25 cc, normal cisterns, no shift, 3 = no mass > 25 cc, absent or compressed cisterns, no shift > 5 mm; 4 = same as 3 but with shift > 5 mm, 5 = + mass > 25 cc with surgical evacuation; 6 = + mass > 25 cc without surgical evacuation*

Marshall score (1-6): ____________

**CT head #2**
- □ unknown or none □ yes
- Repeat CT: □ same
- Repeat CT head: □ normal □ abnormal

Date: ___ / ____ / _________

- □ less (better)
- □ increase (worse)

Skull fracture: □ unknown or none □ yes
SDH: □ unknown or none □ yes
EDH: □ unknown or none □ yes
IPH: □ unknown or none □ yes
IVH: □ unknown or none □ yes
SAH: □ unknown or none □ yes
Shift: □ unknown or none □ yes
Herniation: □ unknown or none □ yes

Marshall score (1-6) ____________

**LABS:**

- Platelet count (initial, may be from outside hospital): ________ per microliter □ ND
- INR level (initial, may be from outside hospital): ________ per microliter □ ND
Follow up phone call
- at least 2 weeks after seen in ED; if has been in-hospital for 2 weeks no need for phone call (fill out “Results”)

☐ dc home from ED  ☐ dc home from hospital < 14 days  ☐ dc home from hospital ≥ 14 days

Consent:
Patient contacted ☐ yes ☐ no  Family contacted ☐ yes ☐ no  EMR contact ☐ yes ☐ no
Number of attempts: ______  Date of phone call: ___/___/____
Patient/family consent ☐ yes ☐ no  If consent declined, reason: __________  Unable to contact ☐ yes ☐ no

Symptoms:
post injury problems ☐ yes ☐ no  headache ☐ yes ☐ no
nausea/vomiting ☐ yes ☐ no  dizziness ☐ yes ☐ no
weakness ☐ yes ☐ no  passing out ☐ yes ☐ no
other _______________________________________

still taking medication (warfarin or plavix)? ☐ yes ☐ no ☐ unknown

Follow up:
seen by PMD ☐ yes ☐ no  date of PMD ___/___/____
seen in ED ☐ yes ☐ no  date of ED ___/___/____
name of ED _______________________
reason for visit to ED _______________________
admitted to hospital ☐ yes ☐ no  date hosp ___/___/____
reason for admission _______________________
name of hospital _______________________
days admitted _______________________

Results:
CT head repeated ☐ yes ☐ no
Repeat CT head: ☐ normal ☐ abnormal

Skull fracture: ☐ unknown or none ☐ unknown or none ☐ yes
SDH: ☐ unknown or none ☐ unknown or none ☐ yes
EDH: ☐ unknown or none ☐ unknown or none ☐ yes
IPH: ☐ unknown or none ☐ unknown or none ☐ yes
IVH: ☐ unknown or none ☐ unknown or none ☐ yes
SAH: ☐ unknown or none ☐ unknown or none ☐ yes
Shift: ☐ unknown or none ☐ unknown or none ☐ yes
Herniation: ☐ unknown or none ☐ unknown or none ☐ yes

Marshall score: _____________
death of patient ☐ yes ☐ no
neurosurgery done ☐ yes ☐ no
type of NS ___________________  Date of NS ___/___/____
**Patients with traumatic ICH: Fill out below**

**Isolated head:** □ yes □ no  
*AIS score:* 1 = minor, 2 = moderate, 3 = serious (non-life threatening), 4 = severe (life threatening, survival probable), 5 = critical (survival uncertain), 6 = unsurvivable

AIS head and neck (0-6): ____________
AIS face (0-6): ____________
AIS chest (0-6): ____________
AIS abdomen (0-6): ____________
AIS extremities (0-6): ____________
AIS external (0-6): ____________
ISS (0-75): ____________

---

**LABS:**

INR level (1<sup>st</sup>) even if out of hospital: _____  
D/T INR level: _____ / _____ / _____  _____:_____  □ ND

---

INR level (2<sup>nd</sup>): _____  
D/T INR level: _____ / _____ / _____  _____:_____  □ ND  _____ min from initial

---

INR level (3<sup>rd</sup>): _____  
D/T INR level: _____ / _____ / _____  _____:_____  □ ND  _____ min from initial

---

INR level (4<sup>th</sup>): _____  
D/T INR level: _____ / _____ / _____  _____:_____  □ ND  _____ min from initial

---

INR level (5<sup>th</sup>): _____  
D/T INR level: _____ / _____ / _____  _____:_____  □ ND  _____ min from initial

---

**TREATMENT:**

PRBCS: □ no or unknown  □ received RBC during first 48 hours _____ units of PRBCs in 1<sup>st</sup> 48 hours □ ND

---

FFP: □ no or unknown □ received FFP during first 48 hours _____ units of FFP in 1<sup>st</sup> 48 hours □ ND

---

Vit K: □ no or unknown □ received Vit K during first 48 hours _____ mg of Vit K in 1<sup>st</sup> 48 hours □ ND

---

FVIIa: □ no or unknown □ received FVIIa  
Weight (kg): _____  □ ND

FVIIa: _________ mcg of FVIIa in 1<sup>st</sup> 48 hours □ ND

FVIIa: _________ mcg/kg of FVIIa in 1<sup>st</sup> 48 hours □ ND

Time from arrival at UCDMC to drug dosing: ________ minutes □ ND
### Study ID: ____________

Prothrombin complex: □ no or unknown  □ received PTC  Weight (kg): _____ □ ND

PTC: __________ mcg of PTC in 1st 48 hours □ ND

PTC: __________ mcg/kg of PTC in 1st 48 hours □ ND

Time from arrival at UCDMC to drug dosing: ________ minutes □ ND

### Neurosurgical intervention:

□ unknown or none  □ yes

ICP monitor (bolt): □ unknown or none □ yes
Burr hole placed: □ unknown or none □ yes
Craniotomy done: □ unknown or none □ yes
Intraventricular catheter done: □ unknown or none □ yes
Subdural drain done: □ unknown or none □ yes
Use of mannitol for ICP: □ unknown or none □ yes
Use of hypertonic saline for ICP: □ unknown or none □ yes

Other neurosurgical intervention (describe): __________________________________________

Date and time of neurosurgical intervention: _____/_____/_____  _____:_____

If no exact date and time documented, give best estimate in minutes: _______________ minutes

□ no documentation at all of time of neurosurgical intervention

### OUTCOMES:

Mortality: □ yes □ no

Mortality in ED: □ unknown or none □ yes or suspected
Mortality in 48 hours: □ unknown or none □ yes or suspected
Mortality in 30 days: □ unknown or none □ yes or suspected
Discharge home: □ unknown or none □ yes or suspected
Discharge to SNF (Skilled Nursing): □ unknown or none □ yes or suspected
Transfer to outside hospital: □ unknown or none □ yes or suspected
Length of ICU stay: ________________ days □ ND
TE (thromboembolism): □ unknown or none □ yes or suspected
ETT: □ yes □ no  Days on mechanical ventilation (ETT): ________________ days □ ND
Discharge GCS (3-15): _____________ □ ND

1 = death  2 = persistent vegetative, minimal responsiveness, 3 = severe disability, conscious but disable, dependent for daily support, 4 = moderate disability, disabled but independent, can work in sheltered setting, 5 = good recovery, resumption of normal life despite minor deficits

Glasgow outcome score at discharge, (1-5): __________ □ ND
APPENDIX E3. Data collection form for inter-rater reliability.

Kappa Datasheet: Head Trauma + Coumadin/Plavix Study v.6.29.09

<table>
<thead>
<tr>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ UCDMC</td>
</tr>
<tr>
<td>☐ Kaiser Sac</td>
</tr>
<tr>
<td>☐ Kaiser SSC</td>
</tr>
<tr>
<td>☐ Kaiser Ros</td>
</tr>
<tr>
<td>☐ Kaiser SRF</td>
</tr>
<tr>
<td>☐ Kaiser SSF</td>
</tr>
<tr>
<td>☐ Kaiser RWC</td>
</tr>
</tbody>
</table>

Initial GCS in ED (please fill out) ☐ GCS 15 (If Less than 15, complete below)

<table>
<thead>
<tr>
<th>Eye</th>
<th>Verbal</th>
<th>Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ 4 Spontaneous</td>
<td>☐ 5 Oriented</td>
<td>☐ 6 Follow commands</td>
</tr>
<tr>
<td>☐ 3 Verbal</td>
<td>☐ 4 Confused</td>
<td>☐ 5 Localizes pain</td>
</tr>
<tr>
<td>☐ 2 Pain</td>
<td>☐ 3 Inappropriate words</td>
<td>☐ 4 Withdraws to pain</td>
</tr>
<tr>
<td>☐ 1 None</td>
<td>☐ 2 Incomprehensible sounds</td>
<td>☐ 3 Abnormal flexure posturing</td>
</tr>
<tr>
<td></td>
<td>☐ 1 None</td>
<td>☐ 2 Abnormal extension posturing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ 1 None</td>
</tr>
</tbody>
</table>

Evidence of head trauma (trauma above the clavicles)? ☐ Yes (complete below) ☐ No (skip to GCS question)
1. Is there trauma to face? ☐ Yes ☐ No
2. Is there trauma to neck? ☐ Yes ☐ No
3. Is there trauma to scalp (from above eyebrows to the occiput)? (if yes, fill out below)
   ☐ depressed skull fracture ☐ signs of basilar skull fracture ☐ abrasion ☐ none
   ☐ contusion/hematoma ☐ laceration ☐ other ________________________

Has the patient vomited? ☐ Yes ☐ No ☐ Unknown
Does the patient have a headache? ☐ Yes ☐ No ☐ Unknown
Did (or does) the patient have amnesia or loss of consciousness? ☐ Yes ☐ No ☐ Unknown
If GCS is < 15 and the patient has dementia, do you think the dementia is the sole cause of the abnormal GCS?
   ☐ N/A (GCS 15) ☐ Yes, abnormal GCS is caused by dementia alone ☐ No, abnormal GCS is due to injury ☐ Unknown
Is patient clinically intoxicated? ☐ Yes ☐ No ☐ Unknown
APPENDIX E4. Data collection form for missed eligible patients.

## Data sheet 4: Missed Eligibles

**MRN:** _________  **Name of Patient:** ___________________  **MD:** ____________________

### Location
- UC Davis
- Kaiser North Sacramento
- Kaiser South Sacramento
- Kaiser Roseville
- Kaiser San Rafael
- Kaiser South San Francisco

### 1. Patient information (Based on initial ED):

<table>
<thead>
<tr>
<th>Age (at time of arrival): _________</th>
<th>ND</th>
<th>Gender: Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of ED arrival: <strong>/</strong>/_____</td>
<td>Time of arrival: _________</td>
<td>AM</td>
<td>PM</td>
</tr>
<tr>
<td>GCS _____</td>
<td>ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of warfarin use:</td>
<td>unknown or none</td>
<td>yes or suspected</td>
<td></td>
</tr>
<tr>
<td>History of plavix use:</td>
<td>unknown or none</td>
<td>yes or suspected</td>
<td></td>
</tr>
<tr>
<td>History of aspirin use:</td>
<td>unknown or none</td>
<td>yes or suspected</td>
<td></td>
</tr>
</tbody>
</table>