

Prevention of VTE Among Hospitalized Patients: Electronic Alerts vs. Human Alerts

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Venous thromboembolism (VTE), comprised of deep vein thrombosis (DVT) and pulmonary embolism (PE), is a major cause of death, disability, and economic burden. VTE afflicts millions of individuals worldwide and accounts for several hundred thousand deaths annually in the United States. Few health care providers realize that the case fatality rate for PE, approximately 15 percent, exceeds the mortality rate for acute myocardial infarction.

Treatment of newly diagnosed VTE is difficult. Prevention is the best strategy. Fortunately, effective and safe prophylactic measures against VTE exist, and formal guidelines have been formulated and published.¹⁻² However, despite the endorsement of multiple medical societies and the adoption of guidelines as official hospital policy in many institutions, surveys demonstrate that implementation of VTE prophylaxis among high-risk patients continues to be suboptimal during hospitalization.³⁻⁴

At Brigham and Women's Hospital we have initiated a series of trials aimed at increasing prophylaxis by changing MD behavior and improving implementation of prophylaxis. We have utilized electronic computer generated alerts and a human alerts.

We have developed an electronic alert system, which is integrated with our Computerized Physician Order Entry (CPOE) system but functions independently. We created a risk score criteria by which the system determines the risk of DVT or PE for a particular patient. High risk patients were defined as having 4 or more score points, which could be accumulated with any of the following 8 VTE risk factors: cancer (3 points), prior VTE (3 points), hypercoagulability (3 points), major surgery (2 points), bed rest (1 point), advanced age (1 point), obesity (1 point), or hormone replacement therapy/oral contraceptives (1 point). All the information needed to calculate this risk assessment is stored in the computer system, allowing the process to run in an automated fashion. The system determines whether to generate an alert to the responsible physician and offer an opportunity to order appropriate prophylaxis.

As a quality improvement initiative, we undertook a trial in which high risk VTE patients without prophylaxis orders were randomized to an intervention or control group utilizing this system. The intervention was a single alert to the responsible physician that his or her patient is at high risk of DVT but does not have prophylaxis orders.

The control group patients had a high rate of symptomatic DVT or pulmonary embolism (PE): more than 8% during the 3 months of follow up. Each DVT or PE was confirmed by an imaging test, usually venous ultrasound or chest CT, respectively.

The intervention group had an overall 41% reduction in VTE. The rate of PE reduction was 60%. There was no increase in major or minor bleeding the intervention group. However, VTE prophylaxis was only prescribed for 33.5% of high-risk patients. After the study was published a multi-disciplinary team was convened consisting of physicians, pharmacists, nurses, research coordinators, and program developers to enhance the VTE alerts at BWH.

One of the major aims of enhancing was to engage house staff physicians in order to increase acceptance of the alert. We developed interactive techniques that were integrated into the design of the new alerts. Some of these included: providing the house staff with objective data that computerized alerts in this population decreased the incidence of VTE by 41% and creating an opportunity to capture the rationale for declining the alert. We also hypothesized that many house staff physicians may fear a risk of bleeding with pharmacological prevention. We therefore designed a final opportunity to order mechanical prophylaxis before allowing the user to exit the alert. The team also hypothesized that setting the alerts to generate at a consistent time during morning rounds and notification of the attending physician if action was not taken would increase acceptance. The enhanced VTE alerts generate at 8:30 AM each morning and the attending physician receives a text page 24 hours later if action is not taken.

The house staff physicians are first notified of a high-risk patient at the moment of login to the CPOE system. Once the user clicks on the alert, they are presented with multiple options. A physician may choose to review the alert details, which displays the patient specific criteria that qualified the patient as high-risk. The user is also presented with the results from the original study, access to the DVT prophylaxis order entry template, access to an on-line resource guide, or the option to exit. The DVT prophylaxis template allows the user to select mechanical, pharmacological or a combination of prophylaxis measures. The on-line resource guide provides educational material that is up-to-date with clinical practice. If the user clicks the third option to exit to order entry, escape, or done options they are presented with a screen that prompts selection of a reason for declining the alerts. The reasons provided are patient is already receiving anticoagulants, the risk of bleed outweighs the benefit of anticoagulant therapy, patient is on comfort measures only, scheduled procedure, or other. The user must select a reason in order to proceed. Once a reason is selected, the user has the final opportunity to order mechanical prophylaxis via a second order entry template. The user is reminded that there is not an increased risk of bleeding with mechanical prophylaxis.

We are currently testing our alert system concept in a multicenter randomized trial that will enroll 2,500 hospitalized patients at high risk for VTE also. The trial is now under way, with 13 participating centers that have recruited 687 patients as of January 19, 2007. Our VTE Research Group has assembled this consortium of urban, suburban, and rural centers to study alerts. However, the major design difference compared with our prior trial is that this multicenter study uses physicians, nurses, and pharmacists to screen charts and issue alerts to physicians by paging them and speaking to them, rather than by relying upon a computer to alert the physician. Our participating centers are diverse geographically and emphasize inclusion of community hospitals.

There is still considerable scope for electronic and human alerts to increase prophylaxis rates and reduce the rates of VTE. Therefore, we will focus these new study initiatives on improving our current methods and strategies to further reduce the incidence of VTE.

Reference:

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