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The effect of clinical decision support on adherence to thrombosis prophylaxis guidelines in medical patients; A single center experience

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ABSTRACT

Introduction: Venous thromboembolism (VTE) is an underestimated health problem. The administration of low molecular weight heparins (LMWH) to the appropriate patients dramatically decreases VTE incidence. Clinical decision support (CDS) might contribute to thrombosis prophylaxis guideline adherence.
Methods: A computerized integrated risk score program was used to estimate VTE and bleeding risk of nonsurgical patients. A VTE risk score of ≥4 resulted in an advice to administer LMWH. We selected 64 medical patients before the introduction of CDS (T0) and 64 patients after the introduction (T1). We compared guideline compliance between these groups using chi^2 tests.
Results: No difference between groups was found; Adherence to the guidelines at T0 was 59.4%, the same percentage of 59.4% was found at T1. To evaluate the effect of the introduction of CDS in terms of under and overtreatment we compared the prevalence of over and under treatment at T1 and T0. The OR for receiving under treatment at T1 compared to T0 is 0.48 (95% CI: 0.18-1.30), p = 0.14. The OR for overtreatment at T1 compared to T0 is 1.66 (95% CI: 0.74-3.73), p = 0.22
Conclusion: We found no improvement in guideline adherence towards anti thrombotic prophylaxis in medical patients after the introduction of CDS in this pilot study. There was however a non-significant shift towards over treatment. Possible explanations for these results are the increased awareness of the risk for thromboembolism induced by the study, suboptimal use of CDS and deviation from CDS advice caused by patient's preferences.

Introduction

Deep venous thrombosis (DVT) and pulmonary embolism (PE) collectively referred to as venous thromboembolism (VTE) represent a major health problem for hospitalized patients. The yearly incidence of DVT in The Netherlands is 0.6-1.2 cases per 1000 inhabitants.[1] The reported VTE incidence in hospitalized patients is 100 times greater.[2] Currently, antithrombotic prophylaxis with low molecular weight heparins (LMWH) or in some cases unfractionated heparin is applied to prevent VTE. The positive effect of antithrombotic prophylaxis in general surgical, orthopedic surgical and nonsurgical patients on the incidence of VTE has been firmly established in different studies.[3–5] However, literature provides evidence supporting the thesis that antithrombotic prophylaxis is underused in the hospital setting, leading to avoidable cases of VTE. Different studies demonstrated that in only 30-50% of the patients indicated for prophylaxis appropriate measures are indeed taken.[6–8] The administration of appropriate prophylaxis in medical patients is observed to be even less than in surgical patients.[9] Initiatives promoting the use of clinical decision support systems (CDS) or simple electronic alerts have gained more and more attention and have proven efficacy in terms of adherence to guidelines and in some cases reduction of VTE incidence.[10–14] Especially in institutions such as university hospitals, with a high throughput of inexperienced medical personnel in combination with a complex patient load, CDS could function as a guide for the management of antithrombotic prophylaxis.

We assessed whether the introduction of a computer based CDS embedded in the hospital patient data system might lead to improved adherence to guidelines for antithrombotic prophylaxis in medical patients.

Methods

CDS

From September 1st to December 1st 2013 a pilot study was performed in the Maastricht University Medical Centre (MUMC+) on the

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introduction, use and evaluation of a computer based CDS. Institutional review board approval was obtained (METC 13-5-034). Before the introduction of CDS the application of thromboprophylaxis was left to the discretion of the physician, who could consult locally available web based protocols (ODIN), based on international guidelines. By using CDS a protocol based VTE prophylaxis advice is generated, avoiding the need of consulting the underlying protocol by the prescribing physician. A customized computerized integrated risk score program was used to estimate VTE and bleeding risk of nonsurgical patients, as described below. All physicians involved in the pilot study were collectively informed about the use and function of CDS and were motivated to participate. The first risk assessment for all admitted medical patients was performed within 24 hours after hospitalization and was hereafter repeated daily. The CDS was installed on four stand-alone personal computers on two wards of the Maastricht University Medical Centre (MUMC+). The following inclusion criteria were applied: 1) the patient is non-surgical and admitted to one of the two participating wards and 2) the (expected time) of admission is at least 48 hours. Excluded were 1) patients on therapeutic anticoagulants and 2) patients with active bleeding.

The hospital patient data system (SAP, Germany) menu was extended with a dedicated CDS button on the opening page of the patient's record. The use of this button was not mandatory and if CDS generated a recommendation for antithrombotic prophylaxis, no automatic link to the pharmacotherapeutic ordering system was provided.

The Padua Prediction Score[11] for VTE risk factors, endorsed by the ACCP guidelines 2012[4], was used to compose the CDS data form. This risk assessment model (RAM), prospectively validated in a study with patients not receiving prophylaxis [15] awards each risk factor with a maximum of 3 points. Scores of the different risk factors are computed into a total VTE risk score, by simple addition. VTE risk was considered high at a score of 4 points or more. The bleeding risk was assessed using a non-validated RAM.[16] With a bleeding score of 7 or more points the patient was considered at high risk of bleeding. Both the risk for thrombosis and the risk for bleeding were dichotomized. A VTE risk score of <4 resulted in an advice not to administer prophylaxis, a VTE score of ≥ 4 led to an advice to administer (weight adjusted) LMWH. A bleeding score of >7 resulted in a warning in CDS that bleeding risk was high, in case the score ≤ 7 points the announcement 'low bleeding risk' was depicted within CDS.

Assessment of Compliance

In the period prior to the introduction of the CDS, when only the MUMC+ protocol, mainly based on ACCP 2008 guidelines, was available for physicians as a guide to prescribe the correct antithrombotic prophylaxis, compliance to antithrombotic guidelines was assessed on two randomly selected dates for baseline measurements (T0). The measurements were repeated on two randomly selected dates towards the end of the CDS pilot period (T1). For an overview of the patient flow and measurements see Fig. 1. All risk factors for VTE and bleeding included in the MUMC+ protocol (T0) and the CDS RAMs (T1) were recorded by two independent researchers for all individual patients admitted to one of the participating wards on the day that the sample was taken. The appropriate antithrombotic prophylaxis was established based on the risk stratification methods at hand. In the MUMC+ protocol VTE risk factors are indicated, but no individual weights are awarded and no risk factors for bleeding are stated. In case of perceived increased bleeding risk the advice to administer reduced doses of LMWH, or no LMWH, is given. For the patients assessed at T1 compliance was assessed using the CDS RAMs; for an overview of the risk factors, see Appendix 1. For the assessment at T0 all medical records were reviewed, for risk assessment at T1, medical records were reviewed in case the prescribing physician did not use CDS on the sampling day. Pharmacy records were assessed to verify whether the CDS-generated advice on prophylaxis, resulted in the actual administration of the appropriate prophylaxis. Bed rest, generally poorly reported in medical records, was recorded after interviews with nurses of the participating wards on each date of measurement. Guideline adherence was defined as follows: the patient receives the appropriate prophylaxis (pharmacological or no prophylaxis) on the day the sample is taken.

In case guidelines were not followed, the following 2 options were recorded; 1) Under treatment defined as not receiving LMWH, while an indication was present; 2) over treatment defined as receiving LMWH without indication.

Evaluation of CDS Use

After termination of the pilot we evaluated the use of CDS; a questionnaire consisting of 4 domains was designed to identify possible barriers for CDS use. The questionnaire is based on perceived barriers

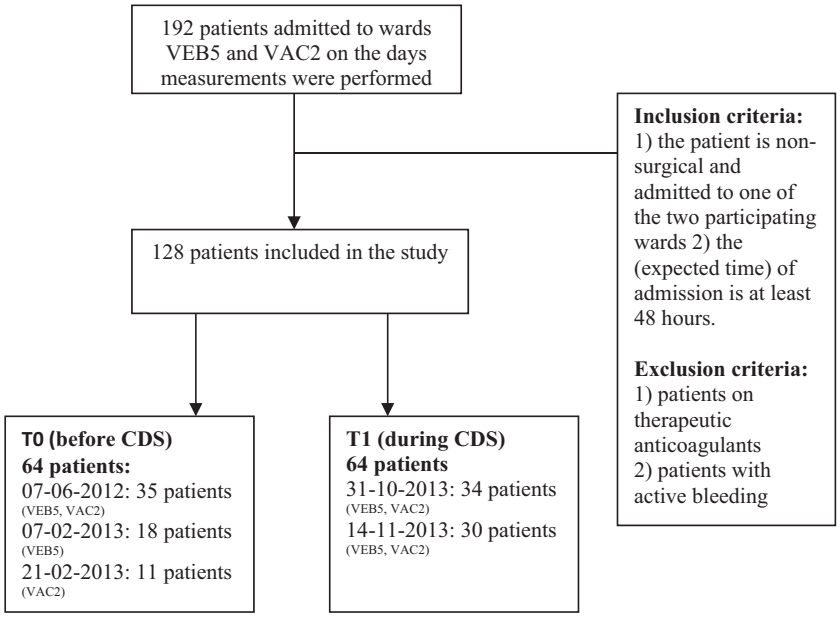

Fig. 1. Patient flow and measurements.