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Die Hausarztmedizin ist nicht nur ein praktisches Fach, sondern auch ein akademisches. In der Schweiz gibt es seit Jahren zwei Sponsor-Gesellschaften, die herausragende Forschungsarbeiten oder Forschungsprojekte zu Themen der Allgemeinen Inneren Medizin (AIM) auszeichnen: Das Kollegium für Hausarztmedizin (KHM) mit Fokus auf die ambulante AIM und die Schweizerische Gesellschaft für Allgemeine Innere Medizin (SGAIM) mit ihrer Forschungsstiftung «SGAIM Foundation». In dieser Serie möchten wir Ihnen in zusammengefasster Form die Ergebnisse oder die geplanten Forschungsvorhaben der Preisträger*innen 2020 vorstellen. Weil die Sprache der wissenschaftlichen Literatur englisch ist, erscheinen die meisten dieser Artikel auf Englisch. Die Preisträger*innen wurden von uns angehalten, in ihren Artikeln Bezug auf die Praxisrelevanz ihrer Arbeit zu nehmen.

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How to predict hospital-acquired venous thromboembolism in medical patients?

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Summary

Hospital-acquired venous thromboembolism (VTE) is one of the leading preventable causes of in-hospital mortality. However, prevention of VTE in medical inpatients remains challenging, as preventive measures such as pharmacological thromboprophylaxis need to be tailored to individual thrombotic risk. The broad objective of this project is to improve VTE prevention strategies in hospitalised medical patients by prospectively validating a novel Swiss risk assessment model, the simplified Geneva score, and by examining the prognostic performance of a new, objective, and innovative definition of patient's immobilization during hospital stay using accelerometry.

Background

Venous thromboembolism (VTE), defined as pulmonary embolism or deep vein thrombosis, is a feared complication among sick patients who are in hospital or were recently hospitalised [1]. Hospitalisation for medical illness has been identified as a risk factor *per se* for VTE [2], with about 75% of all hospital-acquired VTE (HA-VTE) occurring in medical patients [3]. Guidelines recommend administering pharmacological thromboprophylaxis (TPX) specifically to hospitalised medical patients *at increased risk of VTE* during their

inpatient stay [4, 5]. However, assessing thromboembolic risk in the population of medical inpatients is not straight forward given their heterogeneity. Therefore, prevention of HA-VTE, which can be considered as a quality-of-care indicator [1], remains a major challenge for hospital physicians and urgently needs updated research.

Risk stratification to predict HA-VTE using current strategies

To address the challenges of VTE risk stratification in medical inpatients and to standardise VTE risk assessment, guidelines suggest the use of validated risk assessment models (RAMs) [4, 5], which incorporate a number of demographic and clinical characteristics (table 1). However, current RAMs have methodological and practical limitations, including a suboptimal sensitivity to identify high-risk patients [6], items that are not available at admission (e.g., intensive care unit stay [ICU] stay) [7], or an unacceptably large number of items [8], limiting their applicability in everyday practice [6]. In Switzerland, the simplified Geneva score (table 1) has been recently developed as a simpler and thus more usable RAM [9], but prospective external validation is needed before it can be recommended for use in everyday clinical practice.

Immobilisation is an important risk factor for VTE [10, 11]. Thus, immobilisation is not only considered as a predictor in existing VTE RAMs, but it is also one of the most prevalent [8]. Although immobilisation has been recognised as a trigger for TPX administration [12], no standardised definition exists [7–9, 13, 14], limiting the usefulness of this predictor.

Novel approaches to assess mobility

In daily hospital practice, treating physicians mostly base their evaluation of the patient's ability to move on nursing reports or on their own perception [15–17]. However, subjective physician estimation of the patient's mobility can be inaccurate [18]. Recently, objective measures of mobility using accelerometry improved the accuracy of mobility assessment in hospitalised patients [19–23]. Observational studies showed that medical inpatients are immobile most of the time [15, 22, 24]: for example, in a sample of hospitalised older patients capable of walking independently prior to admission, the mean time per day spent standing or walking was 43 minutes [24]. A recent Swiss study confirmed that older medical inpatients moved very little during a hospital stay and had worse outcomes [25]. Interestingly, patient's mobility peaked during mealtimes, indicating that patients were actually able to move.

A meta-analysis of epidemiological studies identified a 2- to 3-fold increase in VTE risk in immobilised medical patients [10], but these findings were limited by the inaccuracy of mobility assessment. An objective evaluation of mobility and dose-dependent threshold to identify patients at high VTE risk has never been explored in the field of VTE prevention, nor compared with the current risk stratification strategies for

Table 1: VTE risk assessment models for risk stratification in hospitalized medical patients.

Score Items	Points			
	Simplified Geneva Score [9]	Original Geneva Score [8]	Padua Score [14]	IMPROVE Score [7, 29]
Previous VTE	3	2	3	3
Hypercoagulable state	2	2	3	2
Cancer	2	2	3	2
Myeloproliferative syndrome		2		
Cardiac failure	2	2	1	
Respiratory failure		2		
Acute infection	2	2	1	
Acute rheumatologic disorder		2		
Immobilization ¹	2	1		1
Reduced mobility ²			3	
Lower limb paralysis or paresis [30]				2
Age >60 years	1	1		1
Age >70 years			1	
Body mass index ≥30kg/m ²	1	1	1	
Recent stroke [8]	1	2	1	
Recent myocardial infarction [8]		2		
Nephrotic syndrome		2		
Hormonal treatment		1	1	
Recent travel (>6 hours)		1		
Chronic venous insufficiency		1		
Pregnancy		1		
Dehydration		1		
Recent trauma or surgery (<1 month)			2	
Stay in intensive or coronary care unit				1
Cut-offs [5, 7–9, 14]				
Low VTE risk	0–2	0–2	0–3	0–1
High VTE risk	≥3	≥3	≥4	≥2

¹ for the IMPROVE score, immobilization was considered if the patient was being confined to bed or chair with or without bathroom privileges for ≥7 days immediately prior to and during hospital admission [30]; for the simplified and original Geneva score, immobilization was defined as complete bedrest or inability to walk for >30min per day for ≥3 days [8]

² for the Padua score, reduced mobility was defined as anticipated bed rest with bathroom privileges for ≥3 days [14]

HA-VTE. Whether novel, objective mobility measures such as accelerometry could predict HA-VTE, and whether incorporation of these objective measures into existing RAMs could improve their predictive ability, must therefore be examined.

Aim of the study

The broad objective of this study is to improve VTE prevention strategies in hospitalised medical patients by prospectively validating the simplified Geneva score, and by developing a new, objective and innovative definition of patient immobilisation in the hospital using accelerometry.

Methods

We are conducting a multicentre prospective cohort study including 1350 consenting adult patients admitted to general internal medicine at three large-volume Swiss tertiary care hospitals. Patients needing therapeutic anticoagulation and those with a life expectancy of less than 30 days are excluded. VTE risk is assessed at admission using the simplified Geneva score, and three other validated RAMs. Mobility is measured during the hospitalisation using accelerometry.

The primary outcome is symptomatic, objectively confirmed fatal and nonfatal HA-VTE, including symptomatic distal and proximal deep vein thrombosis and pulmonary embolism up to 90 days after hospital admission. Secondary medical outcomes include all-cause mortality, clinically relevant bleeding and autonomy as assessed using the modified Barthel Index.

Patients are followed up with a telephone call at 3 months after inclusion). The association and performance of the simplified Geneva score, the three other RAMs, patient's immobilisation assessed either by physician's estimation or by objective accelerometry-based measure for HA-VTE will be examined using time-to-event analyses with competing risk methods, adjusting for TPX use. Time-dependent receiver operating characteristic (ROC) curves will be used to assess the discrimination and accuracy of the RAMs and mobility measures for HA-VTE.

Discussion, conclusion, and implications for practice

This project addresses the risk of hospital-acquired VTE, which is one of the leading potentially preventable causes of in-hospital death in medical inpatients [1]. In accordance with a call for more research on VTE risk assessment [5], our study **explores novel risk stratification strategies** for HA-VTE in medical inpatients using accelerometry-assessed immobility and examines the prospective validity of a new easy-to-use RAM, the simplified Geneva score.

There is a lack of objective information on mobility and its level-dependent impact on VTE in medical inpatients, limiting the ability of physicians to estimate the degree of a patient's mobility or immobility to inform the decision on TPX prescription. The use of a tracking device for measuring mobility during hospital stay may reflect patient mobility more accurately than standard subjective methods of mobility assessment. If our study can establish an objective immobility level at which inpatients would be at higher risk of HA-VTE, increasing patient mobility above this threshold could be a simple and safe novel VTE prevention strategy.

Our project will provide **the first prospective head-to-head comparison** of validated VTE RAMs. The current uncertainty about optimal provision of TPX and the underuse of RAMs owing to their complexity [26] is reflected by the fact that only about 40% of high-risk patients receive appropriate TPX [27], and it is inappropriately provided in almost half of all low-risk patients [28], resulting in unnecessary bleeding events and costs. Our results will provide clear guidance for physicians about optimal VTE risk assessment and thus have the potential to **facilitate and improve VTE** prevention, and reduce HA-VTE and associated deaths in inpatients. The simplified identification of patients who may really benefit from TPX may thus not only result in improved quality of care, but also in cost savings. After 10 months of recruitment (start of study June 2020), almost 700 patients have agreed to participate in the study. First results of our trial will be available in 2022 and will be presented to the SGAIM annual congress.

References

The full list of references is included in the online version of the article at www.primary-hospital-care.ch.

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