

# Venous Thromboembolism (VTE): Risk Assessment in Hospitalized Patients

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## ABSTRACT

**Objective:** To determine the number of hospitalized patients at risk for developing venous thromboembolism (VTE) / deep vein thrombosis (DVT), identifying the most common risk factor and to document the use of thromboprophylaxis.

**Study Design:** Observational and cross-sectional study.

**Place and Duration of Study:** Chandka Medical College Hospital, Larkana, from October to December 2011.

**Methodology:** A total of 170 patients underwent this study and these included 51 (30%) from general medical, and 119 (70%) from surgical units. Inclusion and exclusion criteria were defined and data was collected on printed format. VTE risk assessment was done according to Caprini Model and criteria defined by the American College of Chest Physicians-ACCP.

**Results:** Out of 170 patients, 91 were male and 79 female with mean age of  $39 \pm 16$  years. According to ACCP criteria for VTE risk assessment, 20% (n=34) patients were identified to be at low risk, 20% (n=34) at moderate risk, 47.65% (n=81) at high risk and 12.35% (n=21) at very high risk of developing VTE. The commonest risk factor significantly identified was immobility (54.7%,  $p < 0.005$ ), followed by advancing age (41.17%,  $p < 0.005$ ) and obesity (18.23%). The most common risk factor in all types of surgical patients was anaesthesia for more than 45 minutes 82.35% (n=98/119) and in medical patients advancing age 45% (n=23/51). Only 6 (3.5%) patients received thromboprophylaxis, all were surgical patients of very high-risk category.

**Conclusion:** Majority of studied hospitalized patients were at high risk of developing VTE. Immobility was the commonest risk factor for developing VTE, followed by advancing age and obesity. Very few hospitalized patients actually received thromboprophylaxis.

**Key Words:** Venous thromboembolism. Deep vein thrombosis. Risk assessment. Thromboprophylaxis. Caprini model. ACCP criteria.

## INTRODUCTION

Venous thromboembolism (VTE) represents different clinical manifestations of the same disease process i.e. deep venous thrombosis, pulmonary embolism and central venous catheter associated thrombosis.<sup>1,2</sup> It is one of the most common and yet highly preventable cause of mortality in hospitalized patients.<sup>3</sup>

In patients undergoing major surgery the risk of developing DVT and fatal pulmonary embolism is reported to range between 20 - 30%, and 0.2 - 0.9% respectively.<sup>4,5</sup>

About 50 - 70% of symptomatic VTE events and 80% of fatal pulmonary embolism occur in non-surgical hospitalized patients,<sup>6,7</sup> additionally 25 - 50% of all clinically recognized VTE occur in individuals who are neither hospitalized nor recovering from medical illnesses.<sup>8</sup>

The occurrence and clinical manifestations of VTE vary substantially amongst hospitalized and non-hospitalized patients. DVT most commonly occurs in the lower extremities, mesenteric and pelvic vessels, particularly superficial femoral and popliteal veins in thighs and posterior tibial veins in calves.<sup>1</sup> DVT may occur in upper extremities and is directly related to the increasing use of central venous catheters for dialysis, parenteral nutrition, chemotherapy, etc.<sup>2</sup>

Both medical and surgical, hereditary and acquired, exposing and predisposing risk factors have been implicated in causation of VTE and presence of multiple risk factors have been identified to increase the risk cumulatively. Identification of these risk factors is, therefore, critical for appropriate and timely initiation of thromboprophylactic therapy for prevention of this disease.

Local actual incidence and prevalence rates are under-reported, and the common risk factors in the local population are not well documented. This could probably be due to lack of awareness among clinicians, observation prejudice, substandard documentation, improper diagnostic tools or models for risk assessment, delay in initiation of preventive measures, and almost non-existent autopsy studies.<sup>9</sup> Therefore, thromboprophylaxis is seldom prescribed in local hospitals

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even to patients falling in high risk and very high-risk categories.

This study was started as one of the first institutional studies aimed to evaluate the prevalence of the VTE risk in hospitalized patients, to determine the common risk factors in both surgical and medical patients and to document use of thromboprophylaxis in hospitalized patients in accordance with 8th ACCP Guidelines.<sup>10</sup>

The objective of the study was to determine the number of hospitalized patients at risk for developing venous thromboembolism (VTE) / deep vein thrombosis (DVT), identifying the most common risk factor and to document the use of thromboprophylaxis.

### METHODOLOGY

A cross-sectional observational study was carried out on in-patients at Chandka Medical College Hospital, SMBB Medical University, Larkana, from October to December 2011, after approval from the Ethical Committee. Sample size of 170 was calculated using Wessa Statistics Software11 and allocated to General medicine (n=51), General surgery (n=51), Gynaecology and obstetrics (n=34), Urology (n=17) and Orthopaedics (n=17) patients. Inclusion criteria were; patients admitted to the above mentioned units during the study period with hospital stay of more than 3 days and surgical patients who underwent general / spinal anaesthesia for more than 45 minutes.

The exclusion criteria were patients admitted with established DVT, those who did not consent for inclusion in the study and others with relative contraindications to pharmacologic prophylaxis like severe head injuries, non-operatively managed liver or spleen injuries, spinal column fracture with epidural hematoma, severe thrombocytopenia, coagulopathy and renal failure.

A printed questionnaire was used to collect data about patient's demographic characteristics, medical history, prior hospital admissions, and risk factors for VTE (identified by Caprini Model).<sup>10</sup> The VTE risk for each patient was evaluated using the American College of Chest Physicians (ACCP) evidence-based consensus guidelines (2008) and the use of VTE prophylaxis and method (mechanical or pharmacological) was recorded.

Patients were categorized into low risk, moderate, high and very high risk groups. Mean and frequency distributions of patients' demographic and clinical characteristics, as well as principal study outcomes were computed using percentages for qualitative variables and mean ± SD, for quantitative variables. Results were compared between medical and surgical patients using odds relative risk, chi-square test and p-value with significance at p < 0.05.

### RESULTS

A total of 170 patients, 119 (70%) surgical and allied and 51 (30%) medical patients who met the inclusion criteria, included 91 males and 79 females with mean age of 39 ± 16 years and male to female ratio of 1.15:1.

On application of ACCP criteria for VTE risk assessment, 20% (n=34) patients were identified to be at low risk, 20% (n=34) at moderate risk, 47.65% (n=81) at high risk and 12.35% (n=21) at very high risk of developing VTE.

Table I shows the percentage of risk factors in both medical and surgical patients. The most common risk factor identified was immobility found in 54.7% (n=93), followed by advancing age in 41.17% (n=70) and obesity in 18.23% (n=31).

In female patients, pregnancy 20.5% (n=35) and postpartum status 17.6% (n=30) increased the risk of VTE significantly, followed by obesity (p < 0.001), while immobility (p < 0.001) and use of anaesthesia for more than 45 minutes were significantly more common in male patients (Table II).

Similarly, the most common risk factor was anaesthesia for more than 45 minutes in 82.35% (n=98/119) in surgical patients and advancing age in medical patients (45%, n=23/51). Immobility (OR= 0.21, CI=95%, p < 0.001) was significantly more common in surgical patients, while polytrauma and edema were also more common in surgical patients but were not significantly associated with an increased risk of VTE (Table III).

Multiple risk factors like poly trauma, spinal cord injuries, pelvic or long bone fractures, or medical illnesses like congestive cardiac failure, myocardial infarction, or edema increased the risk cumulatively.

**Table I:** Showing risk factors for developing VTE in patients studied.

Risk factors	Surgical	Medical	Total	Percentage
Anaesthesia general / Spinal for > 45 minutes	98	--	98	57.64
Immobility	78	15	93	54.70
Age (40 to 70+ years)	47	23	70	41.17
Obesity	31	--	31	18.23
Pregnancy	34	01	35	20.58
Post-partum	30	---	30	17.64
Edema/ varicose veins	20	05	25	14.7
Pelvic or long bone fractures	16	---	16	9.41
Malignancy	08	00	08	4.70
Poly trauma	07	01	08	4.70
Spinal cord injuries with paralysis	04	02	06	3.52
Family history / personal history of VTE	05	00	05	2.94
Congestive cardiac failure	01	01	02	1.17
Myocardial infarction	01	01	02	1.17
Hematological or genetic risk factors	---	---	---	00

**Table II:** Comparison of risk factor between male and female patients.

Risk factor	Male (n=92)	Female (n=78)	Total (n=170)	Odds ratio	p-value
Anaesthesia	41 (44.56%)	57 (73.07%)	98 (57.64%)	0.296	< 0.001*
Immobility	67 (72.82%)	26 (33.33%)	93 (54.70%)	5.36	< 0.001*
Obesity	06 (6.52%)	25 (32.05%)	31 (18.23%)	0.147	< 0.001*
Edema	10 (10.86%)	15 (19.3%)	25 (14.70%)	0.512	0.125

\* Significant at  $p < 0.05$ **Table III:** Comparison of risk factor between medical and surgical patients.

Risk factor	Medical patients (n=51)	Surgical patients (n=119)	Total (n=170)	Odds ratio	p-value
Immobility	15	78	93	0.21	< 0.001*
Age above 40 years	23	47	70	0.05	0.496
Pregnancy	01	34	35	1.25	< 0.001*
Edema	3	22	25	0.04	0.237
Poly trauma	01	7	08	0.32	0.437
Spinal cord injury with paralysis	02	04	06	1.17	0.999
Myocardial Infarction	01	01	02	2.36	0.511

\* Significant at  $p < 0.05$ 

Furthermore, it was found that only 3.5% (n=6) received thromboprophylaxis. These were all surgical patients belonging to very high-risk group. None of the medical patients received any thromboprophylaxis.

## DISCUSSION

Venous thromboembolism (VTE) is a serious and potentially fatal condition with an annual incidence of 100 persons per 100,000 in the United States<sup>12</sup> and 1.83 per thousand per year in UK.<sup>13</sup> DVT is third most common cardiovascular disease after ACS and stroke<sup>14</sup> and VTE is responsible for 5 - 10% of all hospital deaths.<sup>15</sup> The incidence of VTE is reported to be higher in Caucasians and African Americans and relatively low in Asians and Hispanics,<sup>12</sup> which may be due to a lower prevalence of genetic factors predisposing to VTE, such as factor V Leiden in Asian populations is (0.5%) compared with Caucasians (5%).<sup>12</sup> In this study, none of the patients had genetic factors or hematologic risk factor. Besides genetics, a multitude of factors have been identified in causation of VTE in both hospitalized medical and surgical patients as well as non-hospitalized general population. The common risk factors proposed are advancing age, obesity, surgery, general anaesthesia, trauma, immobility, malignancy, neurologic disease, central venous catheter, prior superficial vein thrombosis, and varicose veins, congenital or acquired thrombophilia.<sup>8,15</sup>

In the current study, immobility was identified the most common risk factor, and was more common in surgical patients, and particularly in older patients. This is in accordance with the published data on association of VTE to hospitalized patients,<sup>16,17</sup> while advancing age

was found to be an independent risk factor in 70 patients, more common among medical patients and males predominantly, as in other studies. Immobility and pelvic or long bone fractures were also found to be more common among males.

Among female patients, pregnancy and postpartum state were the prevalent risk factors. Unlike other studies,<sup>12</sup> hormonal therapy was not found in any of these patients. Furthermore, obesity ( $p < 0.05$ ) was identified as a significant risk factor in female patients. Obesity or overweight BMI status have been linked with an increase risk of VTE among both men and women.<sup>17</sup> Evidence of VTE as the only risk factor for VTE in obese patients are weak, and further research particularly in pathophysiology of VTE in obese patients is required. Multiple risk factors increase the risk cumulatively<sup>12</sup> as in this study.

VTE is usually believed to be complication of major surgery<sup>17</sup> and risk rises with cancer as the cause for surgery, abdominal and thoracic surgical procedures, duration of operative procedure, and general anaesthesia for more than 45 minutes, previous VTE, advanced age, and obesity.<sup>16,17</sup> Nonetheless recent studies in UK, US and large randomized control trials like ENDORSE, MEDENOX have highlighted the fact that risk of VTE in patients with medical conditions is comparable to patients hospitalized for major surgery.<sup>18-21</sup>

Majority (58.8%) of surgical patients were found to be at high risk, and 168% at very high risk of developing VTE, compared to 19.6% and 2% medical patients in this study. The risk of VTE was significantly higher among surgical patients, due to multiple factors such as anaesthesia, trauma, postoperative state of low mobility, and obesity.

In the current study, 20% patients were identified to be at low risk of developing VTE, which is quite comparable to studies from UK<sup>18</sup> and US<sup>19</sup> where 44% and 25% of hospitalized patients respectively were at low risk and were not considered as candidates for preventative measures. While 47.65% of patients were reported to be at high risk and 12.35% at very high risk of developing VTE which too is consistent with reports from developed parts of world, stating the percentage of in-patients at high risk of VTE to vary between 24 - 62%, and patients at extreme risk of developing VTE between 17 - 44%.<sup>18,19</sup>

The ENDORSE (Epidemiologic International Day for the evaluation of patients at risk for venous Thromboembolism in the acute hospital care setting),<sup>20</sup> which enrolled over 68,000 medical and surgical patients from 32 countries, concluded that 51.8% of hospital inpatients were at risk of VTE, but only 58.5% of at-risk surgical patients and 39.5% of at-risk medical patients received VTE prophylaxis. In a report from Jordan, out of 80% patients at high risk of VTE, only 26% received thromboprophylaxis.<sup>22</sup> Similarly, a study carried out on attitude and practices of healthcare providers towards

deep vein thrombosis prophylaxis in Pakistan, reported that 98.8% of the clinicians found DVT prophylaxis clinically important, but only 63.3% prescribed it, and only 10.3% did it routinely.<sup>23</sup>

Zobeiri also reported the knowledge and attitude of clinicians towards DVT prophylaxis to be favorable,<sup>24</sup> but prophylaxis underused, i.e. only 9/276 (3.2%) high risk patients received prophylaxis, as in this study despite the high prevalence of at risk inpatients, only 3.52% i.e. 6 out of 170 patients received thromboprophylaxis.

According to Goldhaber, three common myths about VTE abound. First, that presentation with inpatient VTE is far more common than that with outpatient VTE; second, that when outpatient VTE does occur, it presents as a condition unprovoked by surgery or recent hospitalization; and third, that outpatient VTE, unlike inpatient VTE, cannot be prevented".<sup>25</sup>

But these myths can be broken to improve patient outcome, save lives, and reduce the financial burdens on individuals and nations, and the key being prevention.

### CONCLUSION

Despite the high number of patients at substantial risk of developing VTE, the clinician practices for providing VTE prophylaxis were suboptimal particularly in acutely ill hospitalized medical and surgical patients. There is a need for implementation of existing evidence based guidelines proposed by ACCP.

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