

# Nursing Management for Prevention of Deep Vein Thrombosis (DVT) / Venous Thrombo-Embolicism (VTE) in Hospitalized Patients



Ministry  
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Group

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**Monitoring, assessment and skin care of lower limbs**

- D/4** In patient with GECS, monitor circulation of lower limbs daily by removing the GECS. Do not remove GECS for more than 30 minutes daily.
- D/4** Remove GECS once a day to allow skin care, hygiene and assessment of skin.
- D/4** In patient with history of arterial insufficient disease, reassess and monitor the neurovascular status more frequently.



**Key References**

Autar, R. (2003). The management of deep vein thrombosis: The Autar DVT risk assessment scale re-visited. *Journal of Orthopaedic Nursing*, 7, 114-124.

Scottish Intercollegiate Guidelines Network. (2002). Prophylaxis of Venous Thromboembolism: A national guideline. *SIGN Publication*, no. 62.

The Joanna Briggs Institute for Evidence Based Nursing and Midwifery. (2001). *Best Practice: Graduated Compression Stockings for the Prevention of Post-operative Venous Thromboembolism*, 5(2), 1-4.

**Acknowledgments**

Singapore Ministry of Health Nursing Clinical Practice Guidelines Workgroup on Nursing Management for Prevention of Deep Vein Thrombosis (DVT) / Venous Thrombo-Embolism (VTE) in Hospitalized Patients.

**Levels of Evidence and Grades of Recommendation**

Level	Type of Evidence
1 <sup>++</sup>	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.
1 <sup>+</sup>	Well conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias.
1 <sup>-</sup>	Meta analyses, systematic reviews, or RCTs with a high risk of bias.
2 <sup>++</sup>	High quality systematic reviews of case-control or cohort or studies; High quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal.
2 <sup>+</sup>	Well conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal.
2 <sup>-</sup>	Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal.
3	Non-analytic studies e.g. case reports, case series.
4	Expert opinion.

Grade	Recommendation
<b>A</b>	At least one meta-analysis, systematic review, or RCT rated as 1 <sup>++</sup> , and directly applicable to the target population; or A body of evidence, consisting principally of studies rated as 1 <sup>+</sup> , directly applicable to the target population, and demonstrating overall consistency of results.
<b>B</b>	A body of evidence, including studies rated as 2 <sup>++</sup> , directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1 <sup>++</sup> or 1 <sup>+</sup>
<b>C</b>	A body of evidence including studies rated as 2 <sup>+</sup> , directly applicable to the target population and demonstrating overall consistency or results; or Extrapolated evidence from studies rated as 2 <sup>++</sup>
<b>D</b>	Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2 <sup>+</sup>

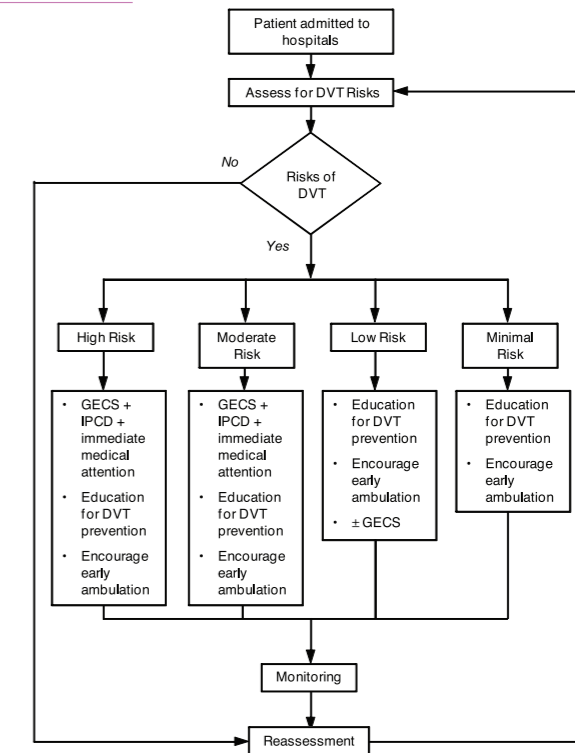
**MOH Nursing Clinical Practice Guidelines 02/2008**

**NURSING MANAGEMENT FOR PREVENTION OF DEEP VEIN THROMBOSIS (DVT) / VENOUS THROMBO-EMOBOLISM (VTE) IN HOSPITALIZED PATIENTS**

**Scope of the Guidelines**

These clinical practice guidelines are tools for guiding the delivery of nursing care to patients who are at risk of developing DVT / VTE; and are intended for healthcare workers who provide care and interventions for adults in healthcare institutions. The recommendations are not applicable for prevention of DVT / VTE in children population and patients with existing DVT / VTE.

**Algorithm for the Nursing Management for Prevention of DVT / VTE in Hospitalized Patients**



## Summary of Recommendations

### A. ASSESSMENT

#### Risk Assessment Scale

**B/2++** Assess all patients for risk of DVT upon admission using Autar (2003) Deep Vein Thrombosis Risk Assessment Scale.

### B. INTERVENTIONS

**B/2++** Use the following DVT / VE risks stratification table to guide intervention.

**DVT / VE Risks Stratification Table**

Score	Risk Categories	Interventions
<6	Minimal risk	Ambulation and education
7-10	Low risk (<10%)	Ambulation, education and/or GECS
>11	Moderate risk (11-40%)	Ambulation, education, GECS, IPC and medical attention

#### Ambulation

**D/4** For patient with minimal DVT / VE risks of <6, nurses should encourage early ambulation as soon as clinical condition permits.

#### Education

##### Educational programmes

**D/4** Educational programmes for DVT / VTE prevention should be individualised, comprehensive and directed at all levels of healthcare providers, patients and caregivers.

##### Initiation of patient education

**D/4** Educate patients on DVT / VTE prevention as soon as possible, when clinical condition permits.

#### Topics for educating patients, family members and carers

**D/4** Educate on the risk factors for developing DVT / VTE.

**D/4** Educate on the signs and symptoms of DVT / VTE, and seek immediate medical attention.

**D/4** Teach the types of physical activities to prevent venous stasis and promote tissue perfusion.

**D/4** Teach on the correct technique of putting on and removing the GECS.

**D/4** Provide written health education materials on prevention of DVT / VTE to patients, family members and caregivers.

#### Education for health care providers

**D/4** Educate health care providers on the prevention of DVT / VTE and focus on assessment, risk factors, signs and symptoms, nursing interventions, medical treatment, and correct techniques for application of GECS and IPCD.

#### Graduated Elastic Compression Stockings (GECS)

**D/4** For patient with low DVT / VE risks of 7-10, consider use of GECS in addition to early ambulation and education.

#### Contraindications for the use of GECS

**B/2++** In patient with current arterial insufficiency disease, do not use GECS.

#### Measurement of GECS

**D/4** Measure GECS to fit the patient according to manufacturer's recommendation.

#### Type of GECS

**A/1++** Use above knee GECS to prevent DVT.

#### Intermittent Pneumatic Compression Devices (IPCD)

##### Indications

**D/4** For patient with moderate DVT / VE risks of >11, use of IPCD may be considered in addition to early ambulation, education and GECS.

**D/4** IPCD and GECS are recommended for surgical patients.

##### Types of IPCD

**B/1+** Apply calf-thigh IPCD to prevent DVT after non-lower extremity trauma.

##### Application of IPCD

**D/4** Ensure that the sleeve of the IPCD is properly applied, well fitted and the device in operation at all times.

**D/4** Remove the sleeves of the IPCD at specified intervals daily to inspect the skin for redness or sign of skin break down.

#### Prophylactic anticoagulation

**D/4** For patient with moderate DVT / VE risks of >11, consider addition of anticoagulation in addition to early ambulation, education and use of GECS to prevent or minimise risk of developing DVT / VE.

**A/1++** Use a combination of above knee GECS and low molecular weight heparin (LMWH) to prevent DVT for post operative patients who are at risk of developing DVT.

#### Combination Therapy

**D/4** IPCD is recommended as an adjunct therapy to pharmacological prophylaxis.

### C. REASSESSMENT AND MONITORING

#### Frequency of Reassessment

**B/2++** Reassess for risk of DVT when there is a change in patient medical condition and mobility status.

**Nursing Management  
for Prevention of Deep Vein  
Thrombosis (DVT) / Venous  
Thrombo-embolism (VTE)  
in Hospitalized Patients**

February 2008

## STATEMENT OF INTENT

This set of guidelines aims to guide healthcare workers who are involved in caring for patients who require to manage patients with risk of developing deep vein thrombosis (DVT) / venous thrombo-embolism (VTE) in hospitals.

The recommendations are based on the available research findings and existing evidence-based guidelines. However, there are some aspects in which there is insufficient published research and, therefore, consensus of experts in the field has been used to provide guidelines specific to conventional practice.

Every healthcare worker must exercise clinical judgement in the nursing management for prevention of DVT / VTE in hospitalized patients. It is recommended that the guidelines are used with consideration for the individual patient's health status, overall preventive strategies, resource availability, institutional policies and other care options available.

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## FOREWORD

The prevention of deep vein thrombosis (DVT) / venous thrombo-embolism (VTE) is challenging for professionals caring for patients with compromised mobility. Prediction through accurate assessment and concomitant prevention of DVT / VTE using appropriate measures are paramount to reduce an adverse incidence. This however requires the concerted effort of patients, caregivers and healthcare professionals.

I am pleased to present these clinical practice guidelines with the aim to reduce the occurrence of DVT / VTE and its undesirable complications for your setting. I hope you will incorporate these guidelines into your regular nursing practice for the benefit of our patients.

PAULINE TAN C J  
CHIEF NURSING OFFICER

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## 1 INTRODUCTION

### 1.1 Background

Deep vein thrombosis (DVT) is a silent killer and precursor of potentially fatal pulmonary embolism (Autar, 1996). DVT is a major health concern in many patient populations such as orthopaedics, oncology, trauma and patients with decreased mobility status. This condition can lead to life-threatening pulmonary embolism or lifelong circulatory system problems. According to Lee, Gu and Heng (2002), DVT is not uncommon in Singapore. The frequency rate of acute DVT of 15.8 per 10,000 admissions is much higher than previously reported rates of 2.8 and 7.9 per 10,000 admissions in 1990 and 1992, respectively. These findings confirm the need for increased awareness of venous thrombo-embolism (VTE) in local hospitals.

Nurses need to assess patients for the risk of developing DVT and implement necessary preventive measures to minimise the risk of DVT in hospitalized patients.

### 1.2 Definitions

**Deep Vein Thrombosis (DVT)** – It is a medical condition where there is the formation of a thrombus (blood clot) within a deep vein, commonly in the thigh or calf. It is potentially caused or aggravated by long periods of restricted movement.

**Venous Thrombo-embolism (VTE)** – It is a condition where a clot forms within a blood vessel. It can be damaging as it might block the flow of blood. Part of the clot might break away and block a blood vessel further along, cutting off the blood supply to important organs.

**Graduated Elastic Compression Stockings (GECS)** – It is a stocking made with elastic fibres such as spandex, with pressure highest at the ankle and gradually reducing along the length of the limb. GECS increases the blood flow velocity and clears blood from the valve cusps reducing stasis and preventing formation of emboli.

**Intermittent Pneumatic Compression Device (IPCD)** – It is a mechanical method to prevent DVT formation. IPCD compresses lower extremities intermittently (inflation pressure of 35-40mmHg at about 10-12s/min) to reduce venous stasis within the lower extremities and enhance fibrinolysis.

### 1.3 Scope of the Guidelines

These clinical practice guidelines are tools for guiding the delivery of nursing care to patients who are at risk of developing DVT / VTE.

The recommendations presented in this guideline are based on the available evidence. The guidelines aim to:

- (a) specify nursing interventions to prevent DVT / VTE.
- (b) improve patient outcomes through on-going DVT risk assessment and interventions.

These guidelines are intended for healthcare workers who provide care and interventions for adults in healthcare institutions. The recommendations are not applicable for prevention of DVT / VTE in children population and patients with existing DVT / VTE.

## 2 DEVELOPMENT OF GUIDELINES

### 2.1 Training and Guidance

Members of the workgroup attended a two-day workshop conducted by Dr Edwin Chan & Dr Miny Samuel of the Clinical Trials & Epidemiology Research Unit, to learn and discuss the theory and practical issues of developing evidence-based guidelines. The practical training revolved around topic selection and the development of "mock" evidence-based guidelines which developed into these present guidelines.

### 2.2 Strategy and Literature Review

The workgroup performed the literature search systematically using the key words such as 'DVT', 'VTE', 'gradient compression elastic stockings', 'intermittent pneumatic compression device', 'ambulation and DVT', 'education and DVT' in the following electronic databases: CINAHL, MEDLINE and the Cochrane Library. National Guideline Clearinghouse was searched for related guidelines. A systematic review of literature was carried out on the articles found.

### 2.3 Evaluation of Evidence and Grading of Recommendations

We have adopted the revised Scottish Intercollegiate Guidelines Network (SIGN) system which gives clear guidance on how to evaluate the design of individual studies and grade each study's level of evidence (see 3.3.1 and 3.3.2); and how to assign a grade to the recommendation after taking into account external validity, result consistency, local constraints and expert opinion (see 3.3.3). For areas where available evidence was inconsistent or inconclusive, recommendations were made based on the clinical experience and judgement of the workgroup or expert committee reports.

### 2.3.1 Individual Study Validity Rating

All primary studies and reviews addressing a particular topic were appraised using a SIGN checklist appropriate to the study's design. These were individually rated for internal validity using the system below:

Rating	Description
++	<b>All or most</b> of the criteria have been fulfilled. Where they have not been fulfilled the conclusions of the study or review are thought <b>very unlikely</b> to alter.
+	<b>Some</b> of the criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are thought <b>unlikely</b> to alter the conclusions.
-	<b>Few or no</b> criteria fulfilled. The conclusions of the study are thought <b>likely or very likely</b> to alter.

### 2.3.2 Levels of Evidence

Each study is assigned a level of evidence by combining the design designation and its validity rating using the system below:

Level	Type of Evidence
1 <sup>++</sup>	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.
1 <sup>+</sup>	Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias.
1 <sup>-</sup>	Meta-analyses, systematic reviews, or RCTs with a high risk of bias.
2 <sup>++</sup>	High quality systematic reviews of case-control or cohort or studies. High quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal.
2 <sup>+</sup>	Well-conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal.
2 <sup>-</sup>	Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal.
3	Non-analytic studies e.g. case reports, case series.
4	Expert opinion.



### 2.3.3 Grades of Recommendation

The detailed results of each study and mitigating local circumstances were considered in formulation of each recommendation which was then graded using the system below:

Grade	Recommendation
A	At least one meta-analysis, systematic review, or RCT rated as 1 <sup>++</sup> , and directly applicable to the target population; or a body of evidence, consisting principally of studies rated as 1 <sup>+</sup> , directly applicable to the target population, and demonstrating overall consistency of results.
B	A body of evidence, including studies rated as 2 <sup>++</sup> , directly applicable to the target population, and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1 <sup>++</sup> or 1 <sup>+</sup> .
C	A body of evidence including studies rated as 2 <sup>+</sup> , directly applicable to the target population and demonstrating overall consistency or results; or extrapolated evidence from studies rated as 2 <sup>++</sup> .
D	Evidence level 3 or 4 ; or extrapolated evidence from studies rated as 2 <sup>+</sup> .

### 2.3.4 Interpretation of the D/4 grading

The grading system emphasises the quality of the experimental support underpinning each recommendation. The grading D/4 was assigned in cases where

- it would be unreasonable to conduct a RCT because the correct practice is logically obvious;

- recommendations were derived from existing high quality evidence-based guidelines. We alert the user to this special status by appending the initials of their source e.g. D/4 – Joanna Briggs Institute, 2001.

### 2.4 Guidelines Review and Revision

Drafts of the guidelines were circulated to healthcare institutions for peer review on validity, reliability and practicality of the recommendations.

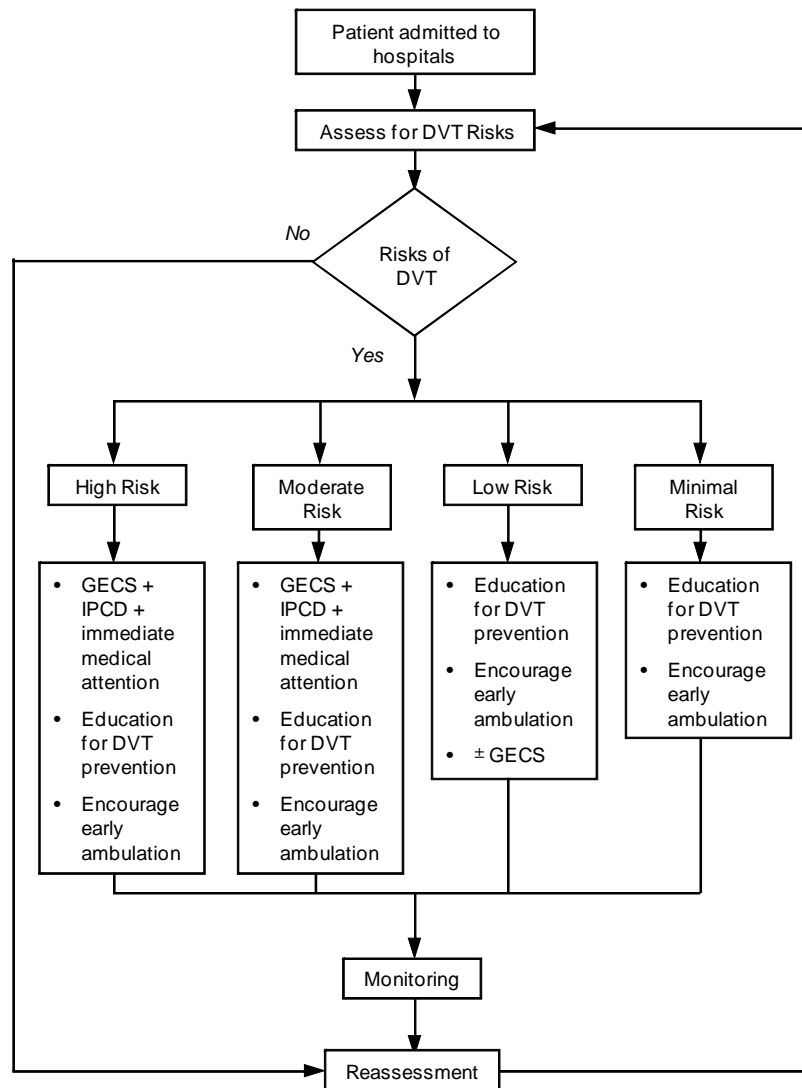
These guidelines will be reviewed and revised periodically to incorporate the latest relevant evidence and expert clinical opinion.

### 2.5 Limitations

These guidelines offer recommendations that are based on available scientific evidence and professional judgement. They are not intended as the legal standard of care.

Users of these guidelines should determine the appropriate and safe patient care practices based on assessment of the circumstances of the particular patient, their own clinical experiences and their knowledge of the most recent research findings.

### 3 ALGORITHM FOR THE NURSING MANAGEMENT FOR PREVENTION OF DVT / VTE IN HOSPITALIZED PATIENTS



### 4 GUIDELINE RECOMMENDATIONS

#### 4.1 Assessment

##### 4.1.1 Risk Assessment Scale

Assess all patients for risk of DVT upon admission using Autar (2003) Deep Vein Thrombosis Risk Assessment Scale. (Refer to Appendix 1 – DVT Risk Assessment Scale)

(B/2++)

##### Rationale:

Risk assessment is performed to identify patients in need of continuous monitoring and to alert the caregivers to consider appropriate preventive measure/s.

(Autar, 1996; Autar, 2003)

The prevention of DVT can be achieved by comprehensive DVT risk assessment, followed by the most appropriate form of prophylaxis.

(Wallis and Autar, 2001)

#### 4.2 Interventions

- Use the following DVT / VE risks stratification table to guide intervention

(B/2++)

##### Rationale:

Patient with different risk categories required different intervention. Types of interventions should be tailored to the degree of risk in developing DVT.

(Autar, 2003)

**DVT / VE Risks Stratification Table**

<b>Score</b>	<b>Risk Categories</b>	<b>Interventions</b>
<6	Minimal risk	Ambulation and education
7-10	Low risk (<10%)	Ambulation, education and/or GECS
>11	Moderate risk (11-40%)	Ambulation, education, GECS, IPC and medical attention

**4.2.1 Ambulation**

- For patient with minimal DVT / VE risks of <6, nurses should encourage early ambulation as soon as clinical condition permits. (D/4)

**Rationale:**

Early mobilisation stimulates calf muscles contraction and relaxation which prevents venous stasis and pooling of blood in the lower extremities. (Aquila, 2001)

**4.2.2 Education**

**4.2.2.1 Educational programmes**

- Educational programmes for DVT / VTE prevention should be individualised, comprehensive and directed at all levels of healthcare providers, patients and caregivers. (D/4)

**Rationale:**

Optimal patients' outcomes for DVT / VTE prevention are achievable when healthcare workers, patients and caregivers participate actively in the educational programmes. (Hohlt, 2000)

**4.2.2.2 Initiation of patient education**

- Educate patients on DVT / VTE prevention as soon as possible, when clinical condition permits. (D/4)

**Rationale:**

Educating patients and increasing their understanding on the importance of DVT / VTE prevention will enhance patients' compliance and reduce anxiety. (Pout, Wimperis and Dilks, 1999)

**4.2.2.3 Topics for educating patients, family members and carers**

- Educate on the risk factors for developing DVT / VTE. (D/4)
- Educate on the signs and symptoms of DVT / VTE, and seek immediate medical attention. (D/4)
- Teach the types of physical activities to prevent venous stasis and promote tissue perfusion. (D/4)
- Teach on the correct technique of putting on and removing the GECS. (D/4)

**Rationale:**

Correct technique of putting on the GECS is important to ensure safe usage and optimal patients' adherence.

(Wallis and Autar, 2001)

- Provide written health education materials on prevention of DVT / VTE to patients, family members and caregivers. (*Refer to Appendix 2 – Patient Education Guide*)

(D/4)

**Rationale:**

Preventive measures are cost-effective, less risky and better received by patients.

(Aquila, 2001; Wallis and Autar, 2001; Launius and Graham, 1998)

Health education materials help to reinforce verbal instruction on the prevention of DVT / VTE and lead to increased patient compliance to treatments.

(Pout, Wimperis and Dilks, 1999)

**4.2.2.4 Education for health care providers**

- Educate health care providers on the prevention of DVT / VTE and focus on assessment, risk factors, signs and symptoms, nursing interventions, medical treatment, and correct techniques for application of GECS and IPCD.

(D/4)

**Rationale:**

Health care providers play a key role in the prevention of DVT / VTE in hospitalized patients. They have to be knowledgeable in this subject to achieve positive patients' outcomes by prompt initiation of preventive measures and treatment for DVT / VTE.

(Aquila, 2001; Launius and Graham, 1998)

**4.2.3 Graduated Elastic Compression Stockings (GECS)**

- For patient with low DVT / VE risks of 7-10, consider use of GECS in addition to early ambulation and education.

(D/4)

**4.2.3.1 Contraindications for the use of GECS**

- In patient with current arterial insufficiency disease, do not use GECS.

(B/2++)

**Rationale:**

Wearing of GECS for long periods compromises blood supply to the lower limbs especially in patients with arterial insufficiency.

(Heath, Kent and Young *et al*, 1987; Registered Nurses Association of Ontario, 2004)

**4.2.3.2 Measurement of GECS**

- Measure GECS to fit the patient according to manufacturer's recommendation.

(D/4)

**Rationale:**

GECS must be worn properly to ensure that there is no bunching-up of stockings. Multiple layers can cause tourniquet effect and swelling of the leg.

(Joanna Briggs Institute, 2001)

Stockings need to fit properly and be applied correctly. If applied too tightly, they may exert a tourniquet effect, thereby promoting venous stasis causing redness and skin breakdown. If applied too loosely, the stocking will not provide adequate compression.

(Aquila 2001; Wallis and Autar, 2001)

#### 4.2.3.3 Type of GECS

- Use above knee GECS to prevent DVT. (A/1++)

##### Rationale:

Above knee GECS are preferred than knee length GECS in preventing DVT. Thigh length GECS were significantly better at preventing postoperative DVT than the knee-length stockings. (Howard, Zaccagnini and Ellis *et al*, 2004)

Above knee GECS are effective in reducing risk of DVT in moderate risk surgical (non-orthopaedic) patients. (Joanna Briggs Institute, 2001)

Use of above knee GECS at the initial stage of hospitalization for acute stroke immobile patients reduces the risk of early DVT. (Muir, Watt and Baxter *et al*, 2000)

#### 4.2.4 Intermittent Pneumatic Compression Devices (IPCD)

##### 4.2.4.1 Indications

- For patient with moderate DVT / VE risks of >11, use of IPCD may be considered in addition to early ambulation, education and GECS (D/4)

##### Rationale:

The moderate to high risk group are more susceptible to developing DVT. (Autar, 1996)

- IPCD and GECS are recommended for surgical patients. (D/4)

##### Rationale:

IPCD with GECS is recommended in surgical patients to increase efficacy in reducing the incidence of DVT. (SIGN, 2002)

##### 4.2.4.2 Types of IPCD

- Apply calf-thigh IPCD to prevent DVT after non-lower extremity trauma. (B/1+)

##### Rationale:

Calf-thigh IPCD prevents DVT more effectively than plantar IPC after major trauma without lower extremity injuries. (SIGN, 2002; Elliott, Dudney and Egger *et al*, 1999)

There is a three times increased risk of DVT (95% CI: 1.1- 9.4) in plantar IPC compared to calf-thigh IPCD. (Elliott *et al*, 1999)

Calf-thigh IPCD compresses more tissues and results in greater local fibrinolysis. (SIGN, 2002)

##### 4.2.4.3 Application of IPCD

- Ensure that the sleeve of the IPCD is properly applied, well fitted and the device in operation at all times. (D/4)
- Remove the sleeves of the IPCD at specified intervals daily to inspect the skin for redness or sign of skin break down. (D/4)

##### Rationale:

Proper application of the sleeves for IPCD and checking of the skin condition are important to ensure effectiveness of IPCD and prevent skin break down. (Aquila, 2001)

#### 4.2.5 Prophylactic anticoagulation

- For patient with moderate DVT / VE risks of >11, consider addition of anticoagulation in addition to early ambulation, education and use of GECS to prevent or minimise risk of developing DVT / VE. (D/4)
- Use a combination of above knee GECS and low molecular weight heparin (LMWH) to prevent DVT for post operative patients who are at risk of developing DVT. (A/1++)

##### Rationale:

In patients who are at low or moderate risk of developing DVT, prophylaxis treatment using a combination of above knee GECS and LMWH can prevent DVT. (Howard *et al*, 2004)

A combination of GECS and LMWH is more effective in reducing the risk of developing DVT in post operative patients than GECS alone. (Amaragir and Lees, 2005)

#### 4.2.6 Combination Therapy

- IPCD is recommended as an adjunct therapy to pharmacological prophylaxis. (D/4)

##### Rationale:

Physical compression complements pharmacological interventions. (Geerts, Pineo and Heit *et al*, 2004)

#### 4.3 Reassessment and monitoring

##### 4.3.1 Frequency of Reassessment

- Reassess for risk of DVT when there is a change in patient medical condition and mobility status. (B/2++)

##### Rationale:

Reassessment should be performed as risk of DVT may change as medical condition changes. (Autar, 1996)

##### 4.3.2 Monitoring, assessment and skin care of lower limbs

- In patient with GECS, monitor circulation of lower limbs daily by removing the GECS. Do not remove GECS for more than 30 minutes daily. (D/4)
- Remove GECS once a day to allow skin care, hygiene and assessment of skin. (D/4)
- In patient with history of arterial insufficient disease, reassess and monitor the neurovascular status more frequently. (D/4)

##### Rationale:

Regular monitoring of neurovascular status is required to assess perfusion status. If GECS is tight fitting, bunched up or folded down, circulation to the limbs may be impaired. (Joanna Briggs Institute, 2001; SIGN, 2002)

## 5 QUALITY ASSURANCE

Healthcare administrators should consider these guidelines in their in-house quality assurance programmes. Nurses should critically review the implications of these guidelines for their routine care delivery, trainee teaching and patient education needs.

### 5.1 Parameters for Evaluation

In the nursing management for prevention of DVT / VTE in hospitalized patients, the quality of care may be evaluated using indicators such as:

- Prevalence rate of DVT / VTE in hospitalized patients
- Knowledge of health care workers in DVT / VTE assessment, risk factors, signs and symptoms, nursing interventions, medical treatment, and correct technique in application of GECS and IPCD. (*Refer to Appendix 3 – Self Assessment*)

Closer monitoring can be conducted for further evaluation of the quality of DVT / VTE nursing management.

### 5.2 Management Role

Healthcare administrators, together with quality assurance teams, should ensure that the targets for the outcome indicators are met. They may benchmark against hospitals or institutions that perform well.

## 6 IMPLEMENTATION OF GUIDELINES

It is expected that these guidelines will be adopted after discussion with healthcare administrators and clinical staff. They may review how these guidelines may complement or be incorporated into their existing institution protocols.

Feedback may be directed to the Ministry of Health for consideration for future review.

## 7 REFERENCES

- Amaragir, S., & Lees, T. (2005). Elastic compression stockings for prevention of deep vein thrombosis. *The Cochrane Database of Systematic Reviews. The Cochrane Library*, Vol (1).
- Aquila, A. (2001). Deep venous thrombosis. *The Journal of Cardiovascular Nursing*, 15(4), 25-44.
- Autar, R. (1996). Nursing assessment of clients at risk of deep vein thrombosis (DVT): The Autar DVT scale. *Journal for Advanced Nursing*, 23, 763-770.
- Autar, R. (2003). The management of deep vein thrombosis: The Autar DVT risk assessment scale re-visited. *Journal of Orthopaedic Nursing*, 7, 114-124.
- Elliott, C.G., Dudney, T.M., Egger, M., Orme, J.F., Clemmer, T.P., Horn, S.D., Weaver, L., Handrahan, D., Thomas, F., Merrell, S., Kitterman, N., & Yeates, S. (1999). Calf-thigh sequential pneumatic compression compared with plantar venous pneumatic compression to prevent deep-vein thrombosis after non-lower extremity trauma. *The Journal of Trauma: Injury, Infection and Critical Care*, 47(1), 25-32.
- Geerts, W., Pineo, G., Heit, J., Bergqvist, D., Lassen, M., Colwell, C., & Ray, J. (2004) Prevention of Venous Thromboembolism: The Seventh ACCP Conference on Anti-thrombotic and Thrombolytic Therapy. *Chest*, 126(3), 338S-400S.
- Heath, D., Kent, S., Johns, D., & Young, T. (1987). Arterial thrombosis associated with graduated pressure anti-embolic stockings. *British Medical Journal*, 295(6598), 580.
- Hohlt, T. (2000). Deep-vein thrombosis prevention in orthopaedic patients: affecting outcomes through interdisciplinary education. *Orthopaedic Nursing*, 19(3), 73-78.
- Howard, A., Zaccagnini, D., Ellis, M., Williams, A., Davies, A., & Greenhalgh, R. (2004). Randomized clinical trial of low molecular weight heparin with thigh-length or knee-length anti-embolism stockings for patients undergoing surgery. *British Journal of Surgery*, 91(7), 842-847.

Launius, B., & Graham, B. (1998). Understanding and preventing deep vein thrombosis and pulmonary embolism. *AACN Clinical Issues: Advanced Practice in Acute and Critical Care*, 9(1), 91-99.

Lee, L., Gu, K., & Heng, D. (2002). Deep vein thrombosis is not rare in Asia – The Singapore General Hospital Experience. *Annual Academic of Medicine Singapore*, 31(6), 761-764.

Muir, K.W., Watt, A., Baxter, G., Grosset, D.G., & Lees, K.R. (2000). Randomized trial of graded compression stockings for prevention of deep-vein thrombosis after acute stroke. *Quality Journal of Medicine*, 93, 359-364.

Pout, G., Wimperis, J., & Dilks, G. (1999). Nurse-led outpatient treatment of deep vein thrombosis. *Nursing Standard*, 13(19), 39-41.

Registered Nurses Association of Ontario. (2004). *Nursing Best Practice Guideline – Assessment and Management of Venous Leg Ulcers*. March, 1-115.

Scottish Intercollegiate Guidelines Network. (2002). Prophylaxis of Venous Thromboembolism: A national guideline. *SIGN Publication*, no. 62.

The Joanna Briggs Institute for Evidence Based Nursing and Midwifery. (2001). *Best Practice: Graduated Compression Stockings for the Prevention of Post-operative Venous Thromboembolism*, 5(2), 1-4.

Wallis, M., & Autar, R. (2001). Deep vein thrombosis: Clinical nursing management. *Nursing Standard*, 15(18), 47-57.



## 8 WORKGROUP MEMBERS

### Chairperson:

Clair Khoo Siok Hiang  
MSN (ACNP), BSc (Hon) Nursing Studies, APN (S'pore), CRNP (USA-Penn), Post-Grad Cert (Teaching), RN, Post-Basic Cert (INCC)

### Members:

Ang Seok Khim  
BHSN, RN, Post-Basic Cert (INCC)

Chng Mui Lee  
MN, BHSN, RN, Adv Dip (MHN)

Giam Poh Eng  
BHSN, RN, RM, Post-Basic Cert (MCN)

Lau Yoke Cheng  
BHSN, RN, SCM, Post-Basic Cert (ONC)

Lee Poh Kim  
RN, Higher Dip (Med/Surg)

Ng Wai May  
BHSN, RN, Adv Dip (NSN)

Ng Yan Hoon  
BHSN, RN, Adv Dip (GN)

Sia Yee Sim  
RN, SCM

Wang Xiao Bei  
BHSN, RN

### Secretariat:

Serena Koh Siew Lin  
RN, RM, BSc (Hons) Nursing Studies, Adv Dip (Midwifery)

### External Consultants:

Dr Edwin Chan Shih-Yen  
BSc, BCMS, PhD  
Director / Head of Evidence-based Medicine  
Clinical Trials & Epidemiology Research Unit

Dr Miny Samuel  
PhD, MSc  
Evidence-based Medicine Analyst  
Clinical Trials & Epidemiology Research Unit

### External Reviewer:

Dr Cosmas Chen Yun Yin  
MBBS(S'pore), FRAS(Edinburgh), MMed(Surgery), FAMS  
Cosmas Chen General Surgery & Vascular Centre Pte Ltd

## APPENDIX 1 DVT RISK ASSESSMENT SCALE

<b>Name :</b> <b>Adm No:</b> <b>Ward:</b> <b>Room / Bed No:</b>	<b>SPECIAL RISK CATEGORY</b> <table border="1"> <tr> <th>Risks</th> <th>Score</th> </tr> <tr> <td>Contraceptive Pill (20 – 35 years)</td> <td>1</td> </tr> <tr> <td>Contraceptive Pill (35 + years)</td> <td>2</td> </tr> <tr> <td>Pregnancy/Puerperium</td> <td>3</td> </tr> </table>	Risks	Score	Contraceptive Pill (20 – 35 years)	1	Contraceptive Pill (35 + years)	2	Pregnancy/Puerperium	3	<b>TRAUMA RISK FRACTORS</b> Score only pre-operative and Score only one item in the box <table border="1"> <tr> <th>Risk</th> <th>Score</th> </tr> <tr> <td>Head</td> <td>1</td> </tr> <tr> <td>Chest</td> <td>1</td> </tr> <tr> <td>Head &amp; Chest</td> <td>2</td> </tr> <tr> <td>Spinal</td> <td>2</td> </tr> <tr> <td>Pelvic</td> <td>3</td> </tr> <tr> <td>Lower Limb</td> <td>4</td> </tr> </table>	Risk	Score	Head	1	Chest	1	Head & Chest	2	Spinal	2	Pelvic	3	Lower Limb	4																																																	
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(Adapted from Autar, 2003)

### Instruction for use of DVT risk assessment scale:

1. Fill in patient name, admission and ward number.
2. Score 3 compulsory items, i.e. age specific group, build and mobility.
3. Score 4 non-compulsory items, special risk category, trauma risk factors, surgical interventions and high risk disease.
4. Add and record the scores from each item.

## APPENDIX 2 PATIENT EDUCATION GUIDE

### PATIENT / FAMILY INFORMATION SHEET

#### What is Deep Vein Thrombosis?

Deep Vein Thrombosis, or DVT, is a condition in which blood clots form in a vein deep in the body.

#### Who are at risk for developing DVT?

Those who:

- had undergone major surgery
- had medical condition such as varicose veins, heart failure, acute myocardial infarction, cancer, stroke etc
- are inactive and on prolonged bed rest
- are obese
- are on birth control pills or hormone therapy
- are 60 and above
- are smokers

#### What are the ways to minimise risks of DVT?

- Early ambulation
- Drink lots of water
- Use of elastic stockings if prescribed
- Take oral medications as prescribed

#### What are the signs & symptoms of DVT?

- Swelling
- Pain
- Warm
- Tenderness
- Red or discoloured skin on the affected limb

#### How is DVT diagnosed?

Your doctor will obtain a medical history and examine you to determine if DVT is present. To confirm the diagnosis, special tests may be ordered by your doctor.

### How is DVT treated?

Depending on the severity of your condition, you may be given oral medication or injection to treat DVT.

If you have any questions about DVT, please ask your doctors or nurses.

## APPENDIX 3 SELF ASSESSMENT

1. Which of the following age group of patients has the HIGHEST risk of developing DVT / VTE?
  - (a) 31-40
  - (b) 41-50
  - (c) 51-60
  - (d) 61 and above
2. The frequency of assessing for DVT/VTE risk is
  - (a) once per shift
  - (b) any change in medical condition and mobility status
  - (c) once upon admission
  - (d) once per day
3. The DVT / VTE risk assessment score for a patient is 11, the appropriate intervention is
  - (a) Education, ambulation, GECS, and/or IPC, immediate medical attention
  - (b) Education, ambulation, GECS, IPC and medical attention
  - (c) Education, ambulation and/or GECS
  - (d) Education, ambulation
4. The preferred length of GECS is
  - (a) waist length
  - (b) calf length
  - (c) above knee length
  - (d) below knee length
5. The duration for removal of GECS for daily skin inspection, hygiene and skin care should not exceed
  - (a) 5 minutes
  - (b) 10 minutes
  - (c) 20 minutes
  - (d) 30 minutes

6. GECS should NOT be used for patient with medical / surgical history of
  - (a) stroke
  - (b) fracture of lower limbs
  - (c) peripheral arterial insufficiency
  - (d) peripheral venous insufficiency
  
7. The preferred length of IPC is
  - (a) plantar length
  - (b) calf length
  - (c) above knee length
  - (d) below knee length
  
8. The trauma risk fraction score in the DVT risk assessment tool for a patient with pelvis injury is
  - (a) 3
  - (b) 4
  - (c) 1
  - (d) 2
  
9. Education of patient on DVT / VTE prevention should be initiated
  - (a) upon admission
  - (b) upon transfer
  - (c) upon discharge
  - (d) as soon as possible, when clinical condition permits
  
10. Which of the following nursing interventions is MOST effective in prevention of DVT?
  - (a) use of GCES
  - (b) use of IPC
  - (c) implement patient education on DVT/VTE prevention
  - (d) encourage early ambulation when medical condition permits

**Answers**

<u>Questions</u>	<u>Answer</u>	<u>Reference</u>
1	(d)	Refer to Appendix1
2	(b)	Refer to 4.1.2
3	(b)	Refer to 4.1.3
4	(c)	Refer to 4.2.1
5	(d)	Refer to 4.2.4
6	(c)	Refer to 4.2.5
7	(b)	Refer to 4.3.3
8	(a)	Refer to Appendix1
9	(d)	Refer to 4.5
10	(d)	Refer to 4.4