MANAGEMENT OF HAEMOPHILIA
STATEMENT OF INTENT

These clinical practice guidelines (CPG) are meant to be guides for clinical practice, based on the best available evidence at the time of development. Adherence to these guidelines may not necessarily guarantee the best outcome in every case. Every healthcare provider is responsible for the management of his/her unique patient based on the clinical picture presented by the patient and the management options available locally.

UPDATING THE CPG

These guidelines were issued in 2018 and will be reviewed in a minimum period of four years (2022) or sooner if new evidence becomes available. When it is due for updating, the Chairman of the CPG or National Advisor of the related specialty will be informed about it. A discussion will be done on the need for a revision including the scope of the revised CPG. A multidisciplinary team will be formed and the latest systematic review methodology used by MaHTAS will be employed.

Every care is taken to ensure that this publication is correct in every detail at the time of publication. However, in the event of errors or omissions, corrections will be published in the web version of this document, which is the definitive version at all times. This version can be found on the websites mentioned above.
TABLE OF CONTENTS

No. Title Page
Levels of Evidence and Formulation of Recommendation iv
Key Recommendations v
Guidelines Development and Objectives vi
Development Group viii
Review Committee ix
External Reviewers x
Algorithm 1: Haemophilia Genetic Inherence (X-linked) xi
Algorithm 2: Genetic Testing for Haemophilia Patient and Carrier Screening xii
Algorithm 3: Physiotherapy Management

1. INTRODUCTION 1

2. CLINICAL PRESENTATION 1

3. INVESTIGATIONS 2
   3.1 Laboratory Tests 2
   3.2 Genetic Tests 3

4. General Principles of Care 4
   4.1 Stratification of Haemophilia Centre with Regards to Haemophilia Services 4
   4.2 National Haemophilia Registry 5

5. TREATMENT 6
   5.1 Non-pharmacological Treatment 6
   5.1.1 Rehabilitation of musculoskeletal system 6
   5.1.2 Protection, Rest, Ice, Compression and Elevation 7
   5.1.3 Joint Protection 7
   5.1.4 Sports/physical activity 7
   5.1.5 Post-operative care 8
   5.1.6 Weight management 8
   5.2 Pharmacological Treatment 8
   5.2.1 Factor replacement therapy 8
   5.2.2 Adjunct therapies 11
   5.2.3 Analgesia 12

6. TREATMENT FOR ACUTE BLEEDING IN SPECIFIC SITES 14
   6.1 Central Nervous System 14
   6.2 Joints 14
   6.3 Musculoskeletal 15
   6.4 Ear, Nose, Throat and Eye 16
   6.5 Gastrointestinal Tract 17
   6.6 Genitourinary Tract 17

7. TREATMENT OF MUSCULOSKELETAL COMPLICATIONS 18
   7.1 Synovitis 18
   7.2 Joint Arthropathy 19
   7.3 Pseudotumour 19

8. INHIBITORS 21
   8.1 Treatment of Acute Bleeding 21
   8.2 Prophylaxis Therapy 22
   8.3 Eradication of Inhibitors 22
8.4 Transfusion-related Infection

9. **HOME THERAPY**

10. **ADHERENCE IN HAEMOPHILIA TREATMENT**

11. **SPECIAL SITUATIONS**
   11.1 Surgeries and Invasive Procedures
   11.2 Management of Pregnant Carrier
   11.3 Vaccination
   11.4 Circumcision

12. **Dental Care**
   12.1 Preventive Dental Measures
   12.2 Dental Procedures
   12.3 Management of Oral Bleeding

13. **Monitoring**
   13.1 Inhibitors
   13.2 Bleeding Frequency
   13.3 Joint Health
   13.4 Radiological Measures

14. **Implementing the Guidelines**
   14.1 Facilitating and Limiting Factors
   14.2 Potential Resource Implications

References

Appendix 1 Example of Search Strategy
Appendix 2 Clinical Questions
Appendix 3 Guidelines on Sample Collection and Transportation
Appendix 4 Recommended Sports/Physical Activities in Haemophilia
Appendix 5 Development of Abnormal Posture Following Bleeds
Appendix 6 Face, Legs, Activity, Cry, Consolability (FLACC) Scale
   Pain Scale
Appendix 7 Analgesic Medication Table
   Suggested Dose Conversion Ratio
Appendix 8 Haemophilia Joint Health Score
Appendix 9 Petterson Score
List of Abbreviations
Acknowledgement
Disclosure Statement
Source of Funding
In line with the current development in CPG methodology, the CPG Unit of MaHTAS is in the process of adapting Grading Recommendations, Assessment, Development and Evaluation (GRADE) in its work process. The quality of each retrieved evidence and its effect size are carefully assessed/reviewed by the CPG Development Group. In formulating the recommendations, overall balances of the following aspects are considered in determining the strength of the recommendations:

- overall quality of evidence
- balance of benefits versus harms
- values and preferences
- resource implications
- equity, feasibility and acceptability

<table>
<thead>
<tr>
<th>Level</th>
<th>Study design</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Evidence from at least one properly randomised controlled trial</td>
</tr>
<tr>
<td>II-1</td>
<td>Evidence obtained from well-designed controlled trials without randomisation</td>
</tr>
<tr>
<td>II-2</td>
<td>Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one centre or group</td>
</tr>
<tr>
<td>II-3</td>
<td>Evidence from multiple time series with or without intervention. Dramatic results in uncontrolled experiments (such as the results of the introduction of penicillin treatment in the 1940s) could also be regarded as this type of evidence</td>
</tr>
<tr>
<td>III</td>
<td>Opinions of respected authorities based on clinical experience; descriptive studies and case reports; or reports of expert committees</td>
</tr>
</tbody>
</table>

**SOURCE: US / CANADIAN PREVENTIVE SERVICES TASK FORCE 2001**
KEY RECOMMENDATIONS

The following recommendations are highlighted by the CPG Development Group (DG) as the key recommendations that answer the main questions addressed in the CPG and should be prioritised for implementation.

- Factor VIII or factor IX assay should be performed in persons suspected of haemophilia with prolonged Activated Partial Thromboplastin Time and normal Prothrombin Time.
- Mixing test should be done to screen for factor inhibitor in haemophilia.
  - If it is positive, Bethesda assay or Nijmegen assay should be done to determine the factor inhibitor level.
- Mutation analysis for haemophilia should be performed on affected male and his mother.
- Cascade screening for haemophilia should be offered to at least first- and second-degree female relatives if the mother of persons with haemophilia is a confirmed carrier.
- Rehabilitation should be offered in person with haemophilia during acute or sub-acute bleeds and those with chronic arthropathy.
- Protection, Rest, Ice therapy, Compression, Elevation (PRICE) should be commenced as a first aid measure in acute and sub-acute bleed.
- Prophylactic factor infusion should be given to all persons with severe haemophilia.
- Analgesia should be offered for pain relief according to its severity in haemophilia.
- Bypassing agents should be used to treat acute bleeding in haemophilia with inhibitors.
- Immune tolerance induction should be considered in all persons with haemophilia with inhibitor.
- Home therapy should be advocated to all persons with haemophilia.
- All injectable vaccinations in haemophilia should be given subcutaneously.
- Comprehensive oral health care in haemophilia should be performed by multidisciplinary team which include dental surgeon.
Monitoring of care in person with haemophilia should include:
- Annual Bleeding Rate
- inhibitor screening
- Annual Haemophilia Joint Health Score
- ultrasound (knee, ankle, elbow) when feasible

GUIDELINES DEVELOPMENT AND OBJECTIVES

GUIDELINES DEVELOPMENT

The members of the DG for this CPG were from the Ministry of Health (MoH) and Ministry of Education. There was active involvement of a multidisciplinary Review Committee (RC) during the process of the CPG development.

A literature search was carried out using the following electronic databases: mainly Medline via Ovid and Cochrane Database of Systemic Reviews and others e.g. Pubmed and Guidelines International Network (refer to Appendix 1 for Example of Search Strategy). The search was limited to humans and English. In addition, the reference lists of all retrieved literature and guidelines were searched to further identify relevant studies. Experts in the field were also contacted to identify further studies. All searches were conducted from 6 March 2016 to 15 August 2018. Literature searches were repeated for all clinical questions at the end of the CPG development process allowing any relevant papers published before 31 July 2018 to be included. Future CPG updates will consider evidence published after this cut-off date. The details of the search strategy can be obtained upon request from the CPG Secretariat.

References were made to other CPGs on haemophilia e.g.
- Guidelines for the Management of Haemophilia (World Federation of Haemophilia, 2012)
- Guidelines for the Management of Haemophilia in Australia (Australian Haemophilia Centre Directors’ Organisation, 2016)

The CPGs were evaluated using the Appraisal of Guidelines for Research and Evaluation (AGREE) II prior to being used as references.

A total of 17 main clinical questions were developed under three different sections (screening, treatment and monitoring). Members of the DG were assigned individual questions within these sections (refer to Appendix 2 for Clinical Questions). The DG members met 19 times throughout the development of these guidelines. All literature retrieved were appraised by at least two DG members using Critical Appraisal Skill Programme checklist, presented in evidence tables and further discussed in DG meetings. All statements and recommendations subsequently formulated were agreed upon by both the DG and RC. Where evidence was insufficient, the recommendations were made by consensus of the DG and RC. This CPG is based largely on the findings of systematic reviews, meta-analyses and clinical trials, with local practices taken into consideration.

The literature used in these guidelines were graded using the US/Canadian Preventive Services Task Force Level of Evidence (2001), while the grading of recommendation was done using the principles of GRADE (refer to the preceding page). The writing of the CPG strictly follows the requirement of AGREE II.

On completion, the draft of the CPG was reviewed by external reviewers. It was also posted on the MoH Malaysia official website for feedback from any interested parties. The draft was

OBJECTIVES

The objectives of the CPG are to provide recommendations on the management of haemophilia in the following aspects:

a) diagnosis  
b) treatment  
c) monitoring

CLINICAL QUESTIONS

Refer to Appendix 2

TARGET POPULATION

a. Inclusion Criteria  
   • All patients with congenital haemophilia

b. Exclusion Criteria  
   • Acquired haemophilia  
   • Other congenital bleeding disorders

TARGET GROUP/USERS

This document is intended to guide health professionals and relevant stakeholders in primary and secondary/tertiary care in the management of haemophilia including:

i. doctors  
ii. allied health professionals  
iii. trainees and medical students  
iv. policy makers  
v. patients and their advocates  
vi. professional societies

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Algorithm 1. Haemophilia Genetic Inheritance (X-Linked)

A. Father with haemophilia Non-carrier mother (normal)

All sons are unaffected
All daughters are carriers

B. Non-haemophilia father (normal) Carrier mother

50% chance of son will have haemophilia
50% chance of daughter will be carriers
Algorithm 2. Genetic Testing for Haemophilia Patient and Carrier Screening

Index case of haemophilia (diagnosed by factor assay)

Offer pre-test counselling to patient and parents and, obtain informed consent

Send specimen using ‘molecular analysis for haemophilia’ request form for each person*

No

Counselling

Carrier status of mother confirmed

Yes

Counselling

Offer carrier screening for female siblings and maternal aunties

*Samples in sodium citrate tubes of index case and both parents if testing is done in Pusat Darah Negara while samples in ethylenediaminetetraacetic acid tubes of index case and mother if testing is done in IMR. Refer to Appendix 3 on Guidelines on Sample Collection and Transportation.
All these activities are preferably carried out within 24-hour of factor infusion.
Sports and physical fitness are important to maintain good muscle tone to protect the joints from the haemophilic-induced injuries, and these activities contribute to improvement in quality of life.
1. INTRODUCTION

Haemophilia is a group of inherited blood disorders in which there is life-long defect in the clotting mechanism. It is inherited as an x-linked recessive; therefore, males are affected and females are carriers. In rare cases female can be affected. In 30% of cases, no family history is obtainable when spontaneous new mutation occurs. The most common types of haemophilia are haemophilia A (factor VIII deficiency) and Haemophilia B (factor FIX deficiency).

These rare disorders are complex to diagnose and manage. Persons with haemophilia (PWH) are at risk of life-threatening condition and musculoskeletal deformities if not treated properly. There are variations in practice among the clinicians in the management of haemophilia. The cost escalates when complication e.g. inhibitor development and chronic arthropathy arises. The cost is expected to be minimised by standardising haemophilia management.

The haematology service started in the blood bank in 1980s and hence for historical reasons, haemophilia care is provided by the blood bank and PWH are referred to the haematology or paediatric wards when required. Currently, haemophilia care has been taken over by the clinicians. In the past two decades many advances have been made in the understanding of these bleeding disorders and their management. In the newly-developed National Haemophilia Programme, the need for a local evidence-based CPG on haemophilia is deemed important. Thus, such document is developed by a multidisciplinary team to provide recommendations on the diagnosis, treatment and monitoring of haemophilia and its complications.

2. CLINICAL PRESENTATION

PWH can present with the following symptoms:

- easy bruising in early childhood
- ‘spontaneous’ bleeding particularly into the soft tissues, muscles and joints
- excessive bleeding following trauma or surgery

Newborn with haemophilia can present with spontaneous intracranial bleed.

Positive family history is present in two-third of all patients while another third has spontaneous mutation.

The most common site of bleeding in haemophilia is the joints (70 - 80%) especially hinged joints (e.g. ankles, knees and elbows).

Bleeding is considered:

- serious if it occurs in the
  - joints (hemarthrosis)
  - muscles, especially deep compartments (iliopsoas, calf and forearm)
  - mucous membranes in the mouth, gums, nose and genitourinary tract
- life-threatening if it occurs in the
  - neck or throat
  - intracranial
  - gastrointestinal

The severity of haemophilia is based on the clotting factor level as shown in Table 1.
# Table 1. Relationship of bleeding severity to clotting factor level in haemophilia

<table>
<thead>
<tr>
<th>Severity</th>
<th>Clotting factor level</th>
<th>Bleeding episodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe</td>
<td>&lt;1 IU/dL (&lt;0.01 IU/ml) or &lt;1% of normal</td>
<td>Spontaneous bleeding into joints or muscles, predominantly in the absence of identifiable haemostatic challenge</td>
</tr>
<tr>
<td>Moderate</td>
<td>1 - 5 IU/dL (0.01 - 0.05 IU/ml) or 1 - 5% of normal</td>
<td>Occasional spontaneous bleeding; prolonged bleeding with minor trauma or surgery</td>
</tr>
<tr>
<td>Mild</td>
<td>5 - 40 IU/dL (0.05 - 0.40 IU/ml) or 5% to &lt;40% of normal</td>
<td>Severe bleeding with major trauma or surgery; spontaneous bleeding is rare</td>
</tr>
</tbody>
</table>

## 3. INVESTIGATIONS

### 3.1 Laboratory Tests

Different bleeding disorders may have similar symptoms as haemophilia. Hence an accurate diagnosis by a good laboratory services is important to ensure management is given appropriately.

Understanding of clinical features are important to guide for appropriate request of laboratory investigations.

Screening tests for suspected hereditary bleeding disorders include:
- Prothrombin Time (PT)
- Activated Partial Thromboplastin Time (APTT)
- platelet count
- investigations of other causes of bleeding disorder must be performed if PT and APTT are normal

When APTT is prolonged, mixing study should be performed. The interpretation of the screening tests is illustrated in Table 2.

### Table 2. Interpretation of screening tests

<table>
<thead>
<tr>
<th>Possible diagnosis</th>
<th>PT</th>
<th>APTT</th>
<th>Platelet count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Haemophilia A or B</td>
<td>Normal</td>
<td>Prolonged</td>
<td>Normal</td>
</tr>
<tr>
<td>Von Willebrand Disease (VWD)</td>
<td>Normal</td>
<td>Normal or prolonged</td>
<td>Normal or reduced</td>
</tr>
<tr>
<td>Platelet defects</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal or reduced</td>
</tr>
</tbody>
</table>

*Normal value depends on individual laboratory reference range.

With regards to factor VIII (FVIII) and factor IX(FIX) assays:
- FVIII or FIX assay is performed to confirm the deficiency of coagulation factor.
- The severity of haemophilia A and B is correlated with FVIII and FIX level respectively (refer to Table 1 in Chapter 2 on Relationship of bleeding severity to clotting factor level in haemophilia).
- To detect all mild Haemophilia A, more than one type of FVIII assay is needed e.g. chromogenic assay.

With regards to inhibitor test in haemophilia:
- Refer to Chapter 8 for indication on inhibitor screening.
- Mixing test can help to screen for factor inhibitor.
- Bethesda assay or Nijmegen assay can determine factor inhibitor level. Inhibitor level $\geq 0.6$ Bethesda unit (BU) is considered positive.

**Recommendation 1**
- Factor VIII or factor IX assay should be performed in persons suspected of haemophilia with prolonged Activated Partial Thromboplastin Time and normal Prothrombin Time.
- Mixing test should be done to screen for factor inhibitor in haemophilia.
  - If it is positive, Bethesda assay or Nijmegen assay should be done to determine the factor inhibitor level.

### 3.2 Genetic Tests

A close collaboration between coagulation laboratory, genetics laboratory and clinical genetic counselling service is fundamental for the provision of a successful genetic diagnostic service. UKHCDO (a), 2010, level III

Haemophilia is an X-linked recessive disorder [refer to Algorithm 1 on Haemophilia Genetic Inheritance (X-Linked)] which affects males, who will pass on the haemophilia gene to their daughters. Female carrying a F8 or F9 gene mutation are carriers. WFH, 2012

The following are considered obligate carriers: WFH, 2012
- daughters of a PWH
- mothers of one son with haemophilia and who have at least one other family member with haemophilia
- mothers of one son with haemophilia and who have a family member as a known carrier of the haemophilia gene
- mothers of two or more sons with haemophilia

Genetic testing for carrier status should be offered to all at-risk female family members of PWH to facilitate genetic counselling. Mutation analysis is best performed on an affected male, while cascade carrier testing should be offered to first-degree female relatives. If the female is a carrier, then clotting studies including FVIII should be undertaken. Ideally, management advice and genetic counselling should be offered to all PWH, carriers and their families to make informed choices, which should be provided through a centre with experience in managing haemophilia. AHCDO, 2016; WFH, 2012

In local setting, molecular testing is offered to the affected child and his mother. If mother is a confirmed carrier, cascade screening will be done for the first- and second-degree female relatives (sisters and maternal aunts).

Genetic testing may also help in assessing risk of inhibitor development in PWH. AHCDO, 2016

The method selected for mutation detection will depend on resources and expertise available in a particular laboratory. UKHCDO, 2010, level III (a); UKHCDO, 2010, level III (b)

For Haemophilia A, it is recommended that severe haemophiliacs should be screened for the F8 intron 22 inversion mutation followed by the F8 intron 1 inversion mutation. This approach should identify the underlying mutation in 45 - 50% of severe haemophilia A patients. The remaining severe haemophilia A pedigrees should then be analysed further by full mutation analysis of FVIII. UKHCDO, 2010, level III (a)

For Haemophilia B, direct deoxyribonucleic acid (DNA) sequencing of the essential regions of F9 should be done without a pre-screening step. UKHCDO, 2010, level III (b)
**Recommendation 2**
- Mutation analysis for haemophilia should be performed on affected male and his mother.
- Cascade screening for haemophilia should be offered to at least first- and second-degree female relatives if the mother of persons with haemophilia is a confirmed carrier.*

*Refer to Algorithm 2 on Genetic Testing for Haemophilia Patient and Carrier Screening.

Prenatal testing may be offered if couple is interested. However, it is not available in public hospitals.

4. GENERAL PRINCIPLES OF CARE

4.1 Stratification of Haemophilia Centre with Regards to Haemophilia Services

Haemophilia is a complex disorder. The wide-ranging needs of PWH and their care givers are best met through a coordinated, comprehensive and multidisciplinary care by a team of healthcare professionals, in accordance with accepted protocols and national CPG.

Comprehensive haemophilia treatment centres (HTCs) should be established to ensure that PWH have access to the full range of services necessary to manage their condition. The aim of care is to improve health and quality of life. This includes prevention of bleeding, long-term management of joint and muscle damage, and management of complications from treatment including inhibitor development and transfusion-transmitted infections.[9]

HTC carries out the following functions and activities:
- provides care for PWH, including diagnosis, treatment, follow-up and rehabilitation
- provides PWH with safe and effective treatment products
- provides a 24-hour emergency treatment service
- provides basic diagnostic and monitoring laboratory support during normal working hours for the more common inherited bleeding disorders
- has access to multidisciplinary support, locally or in conjunction with physiotherapy and orthopaedics, surgery, dental care, hepatology, infectious diseases, obstetrics and gynaecology, paediatric facilities if children are treated, genetics, clinical psychology and social worker
- offers specific treatment for PWH with inhibitors and immune tolerance in collaboration with a Haemophilia Comprehensive Care Centre (HCCC)
- provides advisory service, including genetic counselling, to PWH and healthcare professionals
- promotes information and training programmes on inherited bleeding disorders to PWH and healthcare professionals

HCCC carries out the following additional functions and activities:
- co-ordinates the delivery of haemophilia services - both in hospital and in the community including liaison with affiliated HTCs
- provides a 24-hour advisory service for PWH, families, hospital doctors, general practitioners and affiliated HTCs health care professionals
- provides specialist care for PWH with inhibitors, including surgery
- provides a diagnostic and reference laboratory service with a full repertoire of tests for the diagnosis and monitoring of inherited disorders of haemostasis
• provides a 24-hour laboratory service for clotting factor assays and inhibitors screens
• has access to orthopaedic and/or rheumatological service with provision of surgery
• has access to physiotherapy service
• has access to a specialised obstetric and gynaecological service for the management of haemophilia carriers and women with VWD and other hereditary bleeding disorders
• has access to paediatric facilities if children are treated
• has access to a genetic diagnosis service providing also carrier detection and antenatal diagnosis
• has access to dental service
• has access to hepatology and infectious diseases service for patients with HIV and/or viral hepatitis
• offers professional psychological support
• has access to social worker and welfare advice
• collates data (e.g. product usage, PWH demographics)
• participates in research, including clinical trials

In the local setting, the following stratification is proposed in the management of haemophilia (refer to Figure 1).

HTC = Other hospitals with specialist within a region and not assigned as HCCC

Figure 1. Proposed stratification of haemophilia centres in Malaysia

4.2 National Haemophilia Registry

• National haemophilia registry is of utmost importance to ensure cost-effective treatment of PWH.

National haemophilia registry is a database of information on PWH. The aims of the registry are:

- to increase awareness of the disease prevalence
- to identify the needs of PWH
- to recognise shortcomings in the healthcare delivery system
- to predict future needs and areas of concern
- to empower the national haemophilia organisation and physicians to lobby effectively on behalf of PWH
• A MoH registry on haemophilia: Evatt B et al., 2005, level III
  o contains demographic and clinical information obtained from all hospitals and clinics
  o reflects a true national picture of the condition
  o requires government support to motivate and sustain participation of all treating centres for data entry

Important data in haemophilia registry should include: Osooli M et al., 2016 level III, Dolan G et al., 2014, level III
• epidemiology and clinical care
• co-morbidity and mortality outcomes e.g. allergic reactions, transfusion-transmitted infections, thrombosis and deaths
• joint outcomes
• bleeding specifications and outcomes
• burden of disease and cost of treatment
• patient reported outcomes e.g. annual bleeding rate (ABR), quality of life (QoL), etc. (refer to Chapter 13 on Monitoring)

5. TREATMENT

Repeated joint bleeds is the major cause of morbidity in PWH. In patients with severe haemophilia, bleeding episodes may occur as frequently as 20 - 30 times per year. PWH are 20 - 50 times more likely to develop intracranial haemorrhage (ICH) which can be life-threatening than those without haemophilia, with a reported prevalence of 2.7 - 12% and an incidence rate of 290 - 748/10 000 patient-years. Ljung RC 2007, level III Factor replacement therapy, non-pharmacological and adjunctive treatments are essential in preventing joint damage and other potential serious and life threatening events.

5.1 Non-pharmacological Treatment

5.1.1 Rehabilitation of musculoskeletal system
Rehabilitation in PWH improves joint health status and muscle strength and, reduces pain. Physiotherapists play an important role in the management of both acute and sub-acute bleeds, chronic synovitis, chronic arthropathy and other musculoskeletal pathology in PWH. Post-bleed rehabilitation include PRICE and exercise programmes for restoration of pre-morbid status, minimisation of re-bleed risk and prevention of secondary musculoskeletal complications. WFH, 2012

Rehabilitation must be stressed as an active part in the management of acute joint bleeding episodes in PWH: WFH, 2012
• PWH should be encouraged to change the position of the affected joint from a position of comfort to a position of function as soon as the pain and swelling begin to subside. The gentle passive movement will gradually decrease the flexion of the joint and strive for complete extension. Refer to Appendix 5 on Development of Abnormal Posture Following Bleeds.
• Active movement should be done as much as possible with muscle contractions to minimise muscle atrophy and prevent chronic loss of joint motion.
• Active exercises and proprioceptive training should be continued until complete pre-bleed joint range of motion (ROM) and functioning are restored and, signs of acute synovitis resolve.
• Factor replacement is not necessarily if exercises are progressed appropriately

Rehabilitation, e.g. hydrotherapy, mechanical exercises and strengthening exercises, significantly improve joint health status, ROM and pain score compared with no intervention
in haemophilia. Participation in physical activity, exercise and sports lead to physical and psychological benefits as well as supporting emotional and social well-being of PWH. No adverse effects e.g. bleeding have been reported as a result of any of these exercises.

For PWH with significant musculoskeletal dysfunction, weight-bearing activities that promote development and maintenance of good bone density (e.g. weight training, walking and hiking) should be encouraged. Participation in physical activity, exercise and sports lead to physical and psychological benefits as well as supporting emotional and social well-being of PWH. No adverse effects e.g. bleeding have been reported as a result of any of these exercises.

Manual therapy treatment using ankle joint traction, passive stretching, proprioceptive training, isometric exercise and active counter-resistance exercise significantly improves gastrocnemius muscle circumference and reduces ankle pain compared with educational session and no intervention in haemophilia.

Prolonged immobilisation after fracture in PWH can lead to limited ROM. Physiotherapy should be started once the fracture is stabilised to restore:

- ROM
- muscle strength
- function

Recommendation 3
- Rehabilitation should be offered in person with haemophilia during acute or sub-acute bleeds and those with chronic arthropathy.

5.1.2 Protection, Rest, Ice, Compression and Elevation
Protection, Rest, Ice, Compression and Elevation (PRICE) is important in pain management in haemophilia. It relieves acute pain and decreases risk of re-bleeding.

This is further explained in the following Table 4:

<table>
<thead>
<tr>
<th>Components</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection (P)</td>
<td>• Avoidance of weight bearing</td>
</tr>
<tr>
<td></td>
<td>• Restriction of activities until swelling and temperature of the joint return to normal</td>
</tr>
<tr>
<td></td>
<td>• Use of a sling, removable splint and compressive bandage for the affected joints</td>
</tr>
<tr>
<td>Rest (R)</td>
<td>• Immobilisation until pain resolves</td>
</tr>
<tr>
<td>Ice Therapy (I)</td>
<td>• Should not be applied directly to the skin Should not exceed 20 minutes at 2-hourly intervals</td>
</tr>
<tr>
<td></td>
<td>• Always be guided by levels of pain and discomfort</td>
</tr>
<tr>
<td>Compression (C)</td>
<td>• Configuration follows the limb/joint shape</td>
</tr>
<tr>
<td></td>
<td>• Provision of a graduated compressive force which is comfortable for the individual</td>
</tr>
<tr>
<td>Elevation (E)</td>
<td>• Elevation when sitting and lying in supine position</td>
</tr>
</tbody>
</table>

Recommendation 4
- Protection, Rest, Ice therapy, Compression, Elevation (PRICE) should be commenced as a first aid measure in acute and sub-acute bleed.
5.1.3 Joint protection
Target joints can be protected with braces or splints during physical activity. Adjunctive therapies for bleeding in muscles and joint are important, especially when clotting factor concentrates (CFC) are limited or not available. They include:
- first aid measures e.g. PRICE
- removable splint or compressive bandage
- walking aid

It is advisable for PWH to use appropriate foot wear which provides good cushioning, arch support and wiggle room for toes to reduce risk of bleeding.

5.1.4 Sports/physical activity
PWH should be encouraged to perform physical/sport activities to promote:
- physical fitness
- normal neuromuscular development
- psychological and social benefits
- quality of life (QoL)

Participation in non-contact sports, e.g. walking, swimming and cycling, are encouraged for PWH. It does not increase the risk of bleeding nor development of target joints. PWH who want to cycle need proper and adequate protective gear and for children, should be under supervision.

High contact and collision sports (e.g. soccer, hockey, rugby, boxing and wrestling) and high-velocity sports (e.g. motocross racing and skiing) are best avoided because of the potential life-threatening injuries.

5.1.5 Post-operative care
Physiotherapist plays an important role in management of PWH who has undergone surgical intervention e.g. total knee replacement (TKR) and total hip replacement (THR). Exercise plan is prescribed according to the mobility level of PWH on discharge. This includes:
- PRICE - immediately after operation
- isometric exercise - starts when the drains and bandages are removed; focused on quadriceps strengthening
- mobilisation - includes active exercise, bed mobility and ambulation after 7 - 10 days of post-operation

Post-operative rehabilitation should be carried out gradually by physiotherapist to improve strength, proprioception and normal function of the joint.

The summary on non-pharmacological treatment is shown in Algorithm 3 on Physiotherapy Management in Haemophilia.

5.1.6 Weight management
Body Mass Index (BMI) and body weight can increase due to lack of physical activity. In adults, normal BMI is 18 - 23 kg/m², overweight when BMI >23 - 29.9 kg/m² and obesity if BMI >30 kg/m². In children, overweight and obesity varies according to age.

A high BMI has been associated with:
- significant limitation in ROM of the joints
- increased arthropathic pain and risk of developing target joints
• increased risk of cardiovascular (CV) diseases which may further damage arthropathic joints

Regular physical activity should also be advised. Physiotherapist should advise PWH on modification in daily physical activities if there are functional limitations restricting daily activities. WFH, 2012 This should be accompanied with a proper calorie restricted diet by a dietitian.

5.2 Pharmacological Treatment

5.2.1 Factor replacement therapy

There are two types of CFC used for replacement therapy:

• Plasma Derived Factor (PDF) Concentrates - manufactured via fractionation of human pool plasma
• Recombinant Factor Concentrates – manufactured via DNA engineering technology

In a well regulated environment, guided by regulatory agencies e.g. Food Drug Agency (FDA)/European Medical Agency (EMA), products approved are of adequate efficacy and safety. Farrugia A, 2017, level III

The WFH publishes and regularly updates a Registry of CFC, listing all the currently available factor concentrates in the market approved by regulatory agencies. WFH does not express preference for recombinant over plasma derived factors. Choices of factor concentrates and their classes must be made according to local criteria. WFH, 2012

Efficacy of CFC can be assessed against the scale of response to infusion as shown in Table 5. WFH, 2012

<table>
<thead>
<tr>
<th>Table 5. CFC efficacy scale of response to bleeding episodes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td>Excellent</td>
</tr>
<tr>
<td>Good</td>
</tr>
<tr>
<td>Moderate</td>
</tr>
<tr>
<td>Poor</td>
</tr>
</tbody>
</table>

The currently manufactured products show a good safety record on lipid enveloped viruses e.g. human immunodeficiency virus (HIV), Hepatitis C virus. In the last 25 years, there has been no report on HIV, Hepatitis B and Hepatitis C transmission via plasma derived products. However, the current viral inactivation/removal process does not eliminate majority of the non-lipid viruses/prions e.g. Hepatitis A virus, Parvovirus B19, Creutzfeld’s Jacob. At the moment, the transmission is probably kept at lower level by excluding at risk donors. WFH 2012

• Blood borne infectious diseases remain a concern in haemophilia treatment using plasma-derived products especially the unknown/yet to be discovered viruses which may escape the current viral reduction process.

Factor concentrates vary widely in their purity. Those with low purity have a tendency to cause allergic reaction. Highly purified FIX is preferred to the use of Prothrombin Complex
Concentrate (PCC) as a replacement therapy for Haemophilia B as PCC may predispose to the risk of thromboembolism especially when used in high doses.\textsuperscript{WFH, 2012}

Inhibitor development is the most serious complication of haemophilia treatment. Refer to Chapter 8 on Inhibitors.

A multi-centred RCT demonstrated that PDF containing von Willebrand factor (vWF) had a lower incidence of inhibitor development than those treated with Recombinant Factor VIII (rFVIII).\textsuperscript{Peyvandi F et al., 2016, level I} However the EMA’s Committee for Medical Products for Human Use (CHMP) concluded that there was no clear and consistent evidence to indicate a difference in the incidence of inhibitor development between plasma derived and recombinant factors.\textsuperscript{Farrugia A, 2017, level III}

- In view of risk of blood-borne infection with plasma-derived products, recombinant factor concentrate is the preferred choice for factor replacement in haemophilia.

The optimal approach to haemophilia treatment is using CFC to prevent bleeds and chronic joint damage and, reduce short and long-term complications. Factor replacement can either be on-demand or prophylaxis.

On-demand therapy, also known as episodic therapy, is defined as therapy to stop an acute haemorrhage. Cessation of bleeding does not reverse the deleterious effects on synovial tissues by the blood which has accumulated in the affected joint.

In the absence of an inhibitor, each unit of FVIII/kg body weight infused via intravenous (IV) will raise the plasma FVIII level approximately 2 IU/dL. The half-life of FVIII is approximately 8 - 12 hours.\textsuperscript{BJorkman S et al., 2001, level III}

Prophylactic factor replacement therapy is defined as regular infusion of CFC in an attempt to raise clotting factor levels and to keep them at 1% or higher at all times.\textsuperscript{MaHTAS, 2012, level I} It can be divided into primary, secondary or tertiary prophylaxis.\textsuperscript{WFH, 2012}

- Primary - starts before the second large joint bleed and before age three years old
- Secondary - starts after second large joint bleed but before onset of joint disease
- Tertiary - starts after joint disease to prevent further damage

A Cochrane systematic review and a randomised controlled trial (RCT) showed that prophylactic factor replacement therapy was more effective than on-demand therapy in severe haemophilia in terms of:

- reduction in bleeding frequency (RR=0.30, 95% CI 0.12 to 0.76)\textsuperscript{Iorio A et al., 2011, level I}
- protection from joint damage (RD=0.70, 95% CI 0.39 to 1.01)\textsuperscript{Iorio A et al., 2011, level I}
- lower median number of total bleeding episodes per year which included joint bleeds (0 vs 27.9; p<0.0001)\textsuperscript{Manco-Johnson MJ et al., 2013, level I}
- fewer annualised spontaneous (median of 0 vs 16.3) and trauma-related (median of 0 vs 6.4) bleeding events\textsuperscript{Manco-Johnson MJ et al., 2013, level I}

Prophylactic therapy is associated with a reduction of ICH occurrence in patients with severe haemophilia who are HIV negative (OR=0.52, 95% CI 0.34 to 0.81) or without an inhibitor (OR=0.50, 95% CI 0.32 to 0.77).\textsuperscript{Witmer C et al., 2011, level III}

In a retrospective cohort study, regular prophylactic therapy reduced the risk of inhibitor development by 60% compared with on-demand therapy (RR=0.4, 95% CI 0.2 to 0.8) at 50 exposure days in severe haemophilia.\textsuperscript{Gouw SC et al., 2007, level II-2} In a more recent large
prospective cohort study, the association was observed after 20 days with a HR ranged from 0.22 to 0.32. It was more pronounced in low risk F8 genotypes. Gouw SC et al., 2013, level II-2

However, the Cochrane systematic review showed no significant difference in the risk of inhibitor development and infection between prophylaxis and on-demand therapies. Iorio A et al., 2011, level I

There are many different prophylactic therapy protocols used but optimal regimen remains to be defined. The commonly used protocols are as shown in Table 6.

Table 6. Prophylactic therapy regimens in haemophilia

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>High dose prophylaxis; Malmo protocol</td>
<td>25 - 40 IU/kg three times/week for haemophilia A</td>
</tr>
<tr>
<td></td>
<td>30 - 50 IU/kg twice/week for haemophilia B</td>
</tr>
<tr>
<td>Intermediate dose prophylaxis; Utrecht protocol</td>
<td>15 - 25 IU/kg two to three times/week for haemophilia A</td>
</tr>
<tr>
<td></td>
<td>30 - 50 IU/kg once or twice/week for haemophilia B (after first/second joint bleed or two bleeds per month)</td>
</tr>
<tr>
<td>Low dose prophylaxis</td>
<td>10 IU/kg two times/week for haemophilia A</td>
</tr>
<tr>
<td></td>
<td>20 IU/kg once/week for haemophilia B (secondary prophylaxis)</td>
</tr>
</tbody>
</table>

Standard prophylactic regimens may not be appropriate for all patients with severe haemophilia. The regimen should be individualised according to bleeding phenotype, activity and pharmacokinetics. Other issues e.g. age, venous access and availability of clotting factor should be taken into consideration. Patients on high dose prophylaxis showed improved Haemophilia Joint Health Score (HJHS) and reduction in joint bleeds (p<0.001) but at a significant increase in cost. Fischer K et al., 2013, level II-2. When high dose prophylaxis is not possible due to financial constraint, a low or intermediate dose could be used.

**Recommendation 5**
- Prophylaxis should be given to ALL persons with severe haemophilia.
  - Primary prophylaxis should start following intracranial haemorrhage, first joint bleed, severe intramuscular bleed or by three years old, whichever comes first.
  - Malmo protocol is the preferred prophylactic therapy regimen in haemophilia.

5.2.2 Adjunct therapies

a. Desmopressin

Desmopressin (DDAVP) is a synthetic analogue of vasopressin that boosts plasma level of FVIII and vWF in mild to moderate haemophilia A and certain subtypes of VWD. It may also be used in symptomatic carrier of haemophilia A.

DDAVP is effective and safe in mild haemophilia A. It is also haemostatically effective in 96% of cases when used prophylactically in minor procedures. Di Perna et al., 2013, level II-2

The decision to use DDAVP must be based on baseline concentration of FVIII, increment achieved and duration of treatment required. This is applicable in minor form of bleeding. DDAVP can be given in various routes as shown in Table 7. Mannucci PM, 2012, level III; WFH, 2012
Table 7. Administration of DDVAP

<table>
<thead>
<tr>
<th>Types</th>
<th>Dose</th>
<th>Time to peak</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>0.3 µg/kg diluted into 50-100 ml of physiological saline and infused over 20-30 minutes</td>
<td>30-60 minutes</td>
<td>Rapid infusion can cause tachycardia, flushing, tremor and abdominal discomfort</td>
</tr>
<tr>
<td>Subcutaneous (SC)</td>
<td>0.3 µg/kg</td>
<td>90-120 minutes</td>
<td>Due to anti-diuretic activity, observe for:</td>
</tr>
<tr>
<td>Intranasal</td>
<td>Adult: 1.5 mg/ml in each nostril Those &lt;40 kg, a single dose in 1 nostril is sufficient</td>
<td>90-120 minutes</td>
<td>• hyponatremia • water retention</td>
</tr>
</tbody>
</table>

A single dose of DDVAP either via IV or SC route can be expected to boost the level of FVIII to 3-6 folds higher than the baseline. There is however some variability in response and a test dose is the only way to distinguish good responders from poor or non-responders. Plasma half-life is 5-8 hours for FVIII and 8-10 hours for vWF. PWH treated repeatedly with DDVAP may become less responsive because the stores are exhausted. The average FVIII responses if DDVAP is repeated at 24-hour interval are approximately 30% less than responses obtained after the first dose. Due to its anti-diuretic side effect, plasma osmolality and sodium level should be measured when repeated doses are given.

- DDVAP is contraindicated in children less than two years old who may be at risk of seizure secondary to cerebral oedema due to hyponatremia.

b. Tranexamic Acid

Tranexamic acid (TXA) is an antifibrinolytic agent that promotes clot stability by inhibiting the activation of plasminogen to plasmin. It is particularly useful in controlling bleeding from skin and mucosal surfaces e.g. oral bleeding, epistaxis and menorrhagia.

TXA is available in three preparations i.e. oral, IV and mouthwash. In centres where the mouthwash preparation is not available, the oral form (tablet/capsule) can be dissolved in water and subsequently used as a mouthwash.

TXA can either be used alone or in combination with standard dose of CFC. However, it should be used cautiously in PWH who are given by-passing agents [e.g. activated Recombinant Factor VII (rVIIa) or activated Prothrombin Complex Concentrate (aPCC)] as this may increase the risk of thromboembolism.

TXA should not be used in the treatment of haematuria as it may prevent dissolution of clots in the ureters which may result in obstructive uropathy and potential damage to the kidney function.

c. Others

There is no good evidence on the use of fibrin glue and floseal in haemophilia. However, these treatments have been used in local practice. These treatments had been used fairly common since 1990s in surgical procedures involving high risk patients which includes PWH. The procedures highlighted were circumcision, dental extraction/oral surgery and resection of pseudotumour. It had been observed that there was low risk of bleeding with
significant reduction in the CFC usage when fibrin glue was added in the management of those surgical procedures. Rodriguez-merchant EC, 2017, level III

5.2.3 Analgesia
Pain in PWH may be acute or chronic. This may include pain caused by venous access, joint or muscle bleed, post-operative pain, dental extraction and/or chronic haemophilic arthropathy.

Pain assessment can be done using the following pain scale as recommended by MoH (refer to Table 8 and Appendix 6).

Table 8. Recommended pain scale by MoH

<table>
<thead>
<tr>
<th>Age group</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 3 years</td>
<td>Face, Legs, Activity, Cry, Consolability (FLACC) Scale</td>
</tr>
<tr>
<td>&gt;3 - 7 years</td>
<td>Pain Scale (Faces)</td>
</tr>
<tr>
<td>&gt;7 years and adults</td>
<td>Pain Scale</td>
</tr>
</tbody>
</table>

Pain severity is categorised in Table 9 and its management is described following it.

Table 9. Category of pain

<table>
<thead>
<tr>
<th>Total pain score</th>
<th>Severity of pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 3</td>
<td>Mild</td>
</tr>
<tr>
<td>4 - 6</td>
<td>Moderate</td>
</tr>
<tr>
<td>7 - 10</td>
<td>Severe</td>
</tr>
</tbody>
</table>


Effectiveness of analgesics in PWH:
- Paracetamol is recommended for mild pain. WFH, 2012
- Cyclooxygenase-2 (COX-2) inhibitors are effective analgesia:
  - Celecoxib in chronic synovitis and non-specific mild to moderate pain Rattray B et al., 2005, level II-3
  - Etoricoxib in hemophilic arthropathy Tsoukas C et al., 2006, level II-2
- Mild opioid is recommended as an alternative in moderate pain. WFH, 2012
- If pain is moderate to severe in children, strong opioid is necessary. Morphine is opioid of choice. WHO, 2012
  - In haemophilia, morphine is recommended in severe pain. WFH, 2012

Safety of analgesics in PWH:
- The risk of upper gastrointestinal bleeding increases by two-folds in nonsteroidal anti-inflammatory drugs (NSAIDs) compared with celecoxib or rofecoxib in haemophilic arthropathy although it is statistically not significant. Eyster ME et al., 2007 level II-2
- Celecoxib was noted to have no adverse events including hypertension or other CV events in a non-comparative follow-up study. Rattray B et al., 2005, Level II-3
- Etoricoxib was noted to have higher bleeding duodenal ulcer, upper respiratory tract infection and headache compared with placebo (p=0.043) in a cohort study. Tsoukas C et al., 2006, level II-2

Pain management strategies are as follows: Micromedex, 2018; Frank Shann, 2017; Etoricoxib package insert, 2013; MoH, Cancer Pain, 2010
Notes:
1. Celecoxib: effectiveness and safety are not established in children <2 years old
2. Etoricoxib: effectiveness and safety are not established in patients <16 years old
3. Tramadol: effectiveness and safety not established in children <12 years old; caution in children 12 - 18 years who have risk factors that may increase respiratory depression
4. Codeine: effectiveness and safety are not established in children <18 years old

Recommendation 6
- Analgesia should be offered for pain relief according to pain severity in haemophilia*.

*Refer to Table 9 and Figure 2.

6. TREATMENT FOR ACUTE BLEEDING IN SPECIFIC SITES

Acute bleed should be treated as soon as possible preferably within two hours. Amount of factors to be given is dependent on site and severity; usually it is given until bleeding resolves. Haemostatic agents e.g. TXA should be given concurrently except in genitourinary bleeding. For PWH on prophylaxis with good compliance, prophylactic regime should be reviewed if bleed is not due to trauma.

- In PWH, bleeding in head, neck and gastrointestinal tract is a medical emergency. Factor replacement should precede investigation.

6.1 Central Nervous System

All post-traumatic head injuries and significant headache in PWH must be treated as ICH until proven otherwise.
The initial factor replacement therapy to raise factor levels to 100 IU/dL should precede all investigations. Nagel K et al., 2013, level III; WFH, 2012

ICH must be confirmed by urgent imaging e.g. Computed Tomography (CT) scan/magnetic resonance imaging (MRI) before further administration of factors. WFH, 2012

Following ICH, prophylaxis is indicated. WFH, 2012

Refer to Table 10 on recommended treatment.

6.2 Joints

Haemarthrosis is defined as bleeding into a joint space which may occur spontaneously or in response to trauma especially in moderate and severe haemophilia. The joints most commonly affected are the knees, elbows and ankles. WFH, 2012

Patients often describe a tingling sensation and tightness in the joint preceding the clinical signs of haemorrhosis. The joint then rapidly loses ROM and becomes acutely painful, warm and swollen.

A re-bleed is defined as worsening of the condition while on treatment or within 72 hours of stopping treatment.

Recurrent hemarthroses are almost invariably associated with severe haemophilia. When it occurs in the same joint ≥3 times within a consecutive 6-month period, the joint will become a target joint and eventually lead to haemophilic arthropathy if not treated. WFH, 2012

A joint ceases to be a target joint when there is <2 bleeds into the joint within 12 consecutive months. UKHCDDO, 2017, level III

The goal of treatment of acute haemarthrosis is to stop the bleeding as soon as possible. Subsequent treatment aims to prevent recurrent bleeding and progressive joint damage. The management for this condition are:

- Factor replacement therapy
  - Administer the appropriate dose of factor concentrate to raise the patient’s factor level suitably (refer to Table 10).
  - If bleeding does not stop, a second infusion maybe required by repeating half the initial loading dose in 12 hours (haemophilia A) or 24 hours (haemophilia B) until satisfactory resolution (refer Table 5 and Table 10).
- Pain relief
  Refer to Subchapter 5.2.3.
- Radiological imaging
  Routine use of imaging is not indicated and should be reserved for patients presenting with atypical features, major swelling or trauma of a joint to exclude a concomitant traumatic lesion.
- Rehabilitation
  Rehabilitation should be emphasised in the active management of haemarthrosis. Refer to Subchapter 5.1.1.
- Arthrocentesis (joint aspiration)
  Arthrocentesis may be considered for symptomatic relief of a tense hemarthrosis which shows no improvement 24 hours after conservative treatment. It is safe when done by experienced physicians using established protocol. Manners PJ et al., 2015, level II-
Further evaluation for the presence of inhibitor, septic arthritis or fracture is necessary if the symptoms and signs continue longer than three days.

6.3 Musculoskeletal

Early identification and proper management of muscle bleeding are important to prevent complications e.g. re-bleeding, compartment syndrome, joint contractures and formation of pseudotumours. Clinical features of muscle bleeding are:

- pain if the muscle is stretched or actively contracted
- affected limb is positioned in a comfortable posture to avoid pain
- tenderness upon palpation
- swelling (may not be visible)

The following groups of muscle bleeding are associated with neurovascular compromise and require immediate management to prevent permanent damage and loss of function:

- iliopsoas muscle (risk of femorocutaneous, crural and femoral nerve palsy)
- superior-posterior and deep posterior compartments of the lower leg (risk of posterior tibial and deep peroneal nerve injury)
- flexor group of forearm muscles (risk of Volkmann’s ischemic contracture)

The goal of treatment is to stop the bleeding and prevent re-bleeding, and to restore muscle function. The management for this condition include:

- Factor replacement therapy
  - Administer the appropriate dose of factor concentrate as soon as possible; ideally when the patient recognises the first symptoms of discomfort or after trauma (refer to Table 10).
- Pain relief
  - Refer to Subchapter 5.2.3.
- Radiological imaging
  - Ultrasonography (US) and MRI are important diagnostic tools to confirm diagnosis and monitor recovery especially at critical sites.
- Rehabilitation
  - Refer to Subchapter 5.1.1.

In PWH, choice of sport and level of activity should be based on individual factor levels, bleeding history and physical health to prevent acute muscle bleeding. Routine musculoskeletal review helps to promote general muscle fitness and to individualise exercises for specific sports. Single dose prophylaxis is considered prior to engaging in physical activities that might precipitate bleed in severe haemophiliacs.

Iliopsoas haemorrhage

Iliopsoas haemorrhage has a unique presentation. It may mimic an acute abdomen. Symptoms may include pain in the lower abdomen, groin and/or lower back and, pain on extension of the hip joint. There may be paraesthesia in the medial aspect of the thigh or other signs of femoral nerve compression e.g. loss of patellar reflex and quadriceps weakness.

US is a useful and fastest diagnostic tool to diagnose iliopsoas haematoma.

Management of iliopsoas haemorrhage includes:
• hospitalise the patient for control of pain and strict bed rest
• maintain the factor levels for 5 - 7 days or longer, as symptoms indicate (refer to Table 10)
• monitor recovery using an imaging study (US or MRI)
• limit the patient’s activity until pain resolves and hip extension improves; rehabilitation aims at restoration of complete hip extension before returning to full activity

**Fractures**

Factor concentrate should be given immediately to raise the level to at least 50% and maintained for 3 - 5 days. Low dose factor concentrate may be continued for 10 - 14 days to prevent soft tissue bleeding.\(^\text{WFH, 2012}\)

The management plan should be appropriate for the specific fracture, including operative treatment under appropriate coverage of CFC.\(^\text{WFH, 2012}\)

Do not use circumferential plaster and stabilise the fracture with a splint. Avoid prolonged immobilisation and start physiotherapy as soon as the fracture is stabilised.\(^\text{WFH, 2012}\) Refer to Subchapter 5.1.1 on Rehabilitation of musculoskeletal system.

**6.4 Ear, Nose, Throat and Eye**

For bleeding arising from the ear, nose, throat and eye in PWH, immediately raise patient’s factor levels (refer to Table 10). Antifibrinolytic therapy e.g. TXA may be used as adjunctive therapy. They should be referred to the respective disciplines if necessary.\(^\text{WFH, 2012}\)

**6.5 Gastrointestinal Tract**

For bleeding arising from the gastrointestinal tract in PWH, immediately raise patient’s factor levels (refer to Table 10). Antifibrinolytic therapy e.g. TXA may be used as adjunctive therapy. Imaging may be necessary.\(^\text{WFH, 2012}\)

**6.6 Genitourinary Tract**

For bleeding in the genitourinary tract in PWH, vigorous hydration should be started at 3 L/m\(^2\) for a minimum of 48 hours. The factor level need to be raised up to 50% if there is pain or persistent gross haematuria after 48 hours (refer to Table 10). Watch out for complications e.g. urinary tract obstruction that may require urological referral.\(^\text{WFH, 2012}\)

- Avoid using anti-fibrinolytic agent as it may cause clots leading to urinary tract obstruction.
Table 10. Suggested plasma peak levels and duration of treatment for acute bleeding in specific sites and surgeries

<table>
<thead>
<tr>
<th>Site of bleeding</th>
<th>Desired levels (IU/dL)</th>
<th>Haemophilia A Duration of treatment (days)</th>
<th>Desired levels (IU/dL)</th>
<th>Haemophilia B Duration of treatment (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint</td>
<td>40 - 60</td>
<td>1 - 2 days, longer if response inadequate</td>
<td>40 - 60</td>
<td>1 - 2 days, longer if response inadequate</td>
</tr>
<tr>
<td>Superficial muscle/no neurovascular compromise (except iliopsoas)</td>
<td>40 - 60</td>
<td>2 - 3 days, longer if response inadequate</td>
<td>40 - 60</td>
<td></td>
</tr>
<tr>
<td>Iliopsoas and deep muscle with neurovascular injury/substantial blood loss</td>
<td>Initial Maintenance</td>
<td>80 - 100 30 - 60</td>
<td>Day 1 - 2 Day 3 - 5, sometimes longer as secondary prophylaxis during physiotherapy</td>
<td>60 - 80 30 - 60</td>
</tr>
<tr>
<td>Central nervous system/head</td>
<td>Initial Maintenance</td>
<td>80 - 100 50</td>
<td>Day 1 - 7 Day 8 - 21</td>
<td>60 - 80 30</td>
</tr>
<tr>
<td>Ear, nose, throat and eye</td>
<td>Initial Maintenance</td>
<td>80 - 100 50</td>
<td>Day 1 - 7 Day 8 - 14</td>
<td>60 - 80 30</td>
</tr>
<tr>
<td>Gastrointestinal tract</td>
<td>Initial Maintenance</td>
<td>80 - 100 50</td>
<td>7 - 14 days</td>
<td>60 - 80 30</td>
</tr>
<tr>
<td>Genitourinary tract</td>
<td>Initial Maintenance</td>
<td>80 - 100 50</td>
<td>7 - 14 days</td>
<td>60 - 80 30</td>
</tr>
<tr>
<td>Deep laceration</td>
<td></td>
<td>50</td>
<td>3 - 5 days</td>
<td>40</td>
</tr>
<tr>
<td>Surgery (major)</td>
<td></td>
<td>50</td>
<td>5 - 7 days</td>
<td>40</td>
</tr>
<tr>
<td>Pre-surgery</td>
<td></td>
<td>80 - 100 60 - 80 40 - 60 30 - 50</td>
<td>Day 1 - 3 Day 4 - 6 Day 7 - 14</td>
<td>60 - 80 40 - 60 30 - 50 20 - 40</td>
</tr>
<tr>
<td>Post-surgery</td>
<td></td>
<td>50 - 80 30 - 80</td>
<td>1 - 5 days depending on procedure</td>
<td>50 - 80 30 - 80</td>
</tr>
<tr>
<td>Surgery (minor)</td>
<td></td>
<td>50 - 80 30 - 80</td>
<td>1 - 5 days depending on procedure</td>
<td>50 - 80 30 - 80</td>
</tr>
</tbody>
</table>

*Table is based on country with no resource constraint.


### 7. TREATMENT OF MUSCULOSKELETAL COMPLICATIONS

#### 7.1 Synovitis

Synovitis is characterised by painless chronic swelling of the affected joint, evidenced by clinical examination and imaging e.g. US and/or MRI. 

The goal of treatment is to deactivate the synovium as soon as possible and preserve joint function. The treatment modalities include:

- factor concentrate replacement (refer to Table 10 on joint bleeds)
- physiotherapy (refer to Subchapter 5.1)
- NSAIDs (COX-2 inhibitors) to reduce inflammations
- synovectomy including radiosynovectomy (RS)
RS is a local form of radiotherapy that involves intra-articular injection of small radioactive particles to treat synovitis. It offers a conservative alternative to surgical synovectomy in patients with synovitis and recurrent bleeding in the target joint, which has proven refractory to intensive treatment with clotting factor concentrates.\(^\text{UKHCO, 2017, level III}\)

RS is an effective, safe and minimally invasive procedure in haemophilic synovitis with:\(^\text{Rodriguez-Merchan EC et al., 2014, level III}\)
- significant reduction in articular pain (69.4%), hemarthrosis (64.1%), and degree of synovitis (31.3%)
- improvement in WFH clinical score (19%)
- small number of patients (0.9%) develop complications e.g. knee septic arthritis, severe swelling or small cutaneous burn
- no patient develop cancer

There is no difference in outcomes between patients with prophylaxis and on-demand treatment.

In synovitis (haemophilia and VWD) treated with RS using rhenium-186, the mean time to progression (TTP) is:\(^\text{Zulfikar B et al., 2013, level II-3}\)
- 72.0 \(\pm\) 4.8 months with a median follow-up of 36 months for ankle
- 67.5 \(\pm\) 6.5 months with a median follow-up of 35 months for elbow joint

There is significant inverse correlation between the number of joint bleeding in both ankle and elbow within six months after therapy and TTP (p<0.05). This is independent of patient's age, haemophilia type and severity, inhibitor status, radiological score, ROM status and pre-treatment bleeding frequency.

**Recommendation 7**
- Radiosynovectomy should be considered in haemophilic synovitis with recurrent bleeding in the target joint.

### 7.2 Joint Arthropathy

Chronic haemophilic arthropathy may occur from the second decade of life or earlier, depending on the severity of bleeding and its treatment. The goals of treatment are to improve joint function, relieve pain and assist PWH to continue/resume normal ADL.

The treatment includes:
- pain management (refer to Subchapter 5.2.3)
- rehabilitation (refer to Subchapter 5.1.1)
- secondary prophylaxis should be optimised

Surgical intervention may be considered if these conservative measures fail. These may include prosthetic joint replacement for severe disease involving a major joint (knee, hip, shoulder and elbow). For surgical procedure, adequate resources, including sufficient factor concentrates, laboratory support and post-operative rehabilitation, must be available.

### 7.3 Pseudotumour

Pseudotumour is a rare complication of haemophilia, occurring in 1 - 2% of the haemophilic population.

A pseudotumour is an encapsulated haematoma with a thick, fibrous capsule. Repeated cycles of bleeding and calcification will lead to progressive enlargement of the mass and subsequent erosion of the adjacent bone. The rich vascular supply of the capsule is the
cause of excessive bleeding during and after surgery, and this vascular supply usually originates from more than a single artery.

There are two types of pseudotumour:
- proximal pseudotumour
- distal pseudotumour

Proximal pseudotumour frequently occurs in the proximal axial skeleton, especially around the femur and pelvis. This slow growing tumour occurs more frequently in adults and do not respond to conservative treatment.

Distal pseudotumour predominantly affects younger age group, develop rapidly and appear to be secondary to an intraosseous haemorrhage.

Pseudotumour generally presents with painless, firm, expanding masses that may appear to be multilocular and adherent to the deeper structures. It may remain asymptomatic until complications occur.

The typical radiological features are large soft-tissue mass and areas of adjacent bone destruction. Calcification within the mass is a frequent finding. Pseudotumour of the ilium may cause significant bony erosion with little new periosteal bone formation.

Untreated pseudotumour leads to complications e.g.:
- fistulisation to skin or intraabdominal organs
- infection
- pathological fracture
- septicemia
- internal bleeding
- death

Treatment for pseudotumour

a. Proximal pseudotumour

- Surgical resection
  Surgical resection is curative and should ideally be performed in a comprehensive haemophilia centres. This procedure is usually difficult and carries a high complication rate including vascular and neurological damage, haemorrhage and infection.
  - Embolisation
    - serves as a sole therapeutic modality to reduce the size and stabilise the pseudotumour where surgery poses a great risk of life-threatening haemorrhage
    - has a role to minimise the vascularisation of the pseudotumour and reduce its size prior to surgery

b. Distal pseudotumour

- Irradiation
  Irradiation works by causing direct injury to the blood vessels feeding the pseudotumour and disruption to the endothelial proliferation of the wall of the pseudotumour. It is indicated when the pseudotumour occurs in multiple sites, inaccessible sites and sites where anatomy and function should be preserved. The treatment involves a total dose of 6 - 23.5 Gy (2 Gy per fraction) together with factor replacement. It is effective if the pseudotumour is <10 cm.

- Curettage and filling
  - fibrin seal and cancellous bone graft (involvement of soft tissue and bone)
  - cancellous bone graft alone (bone involvement)
8. INHIBITORS

Inhibitors are antibodies that neutralise clotting factors which develop following factor replacement therapy. The cumulative incidence (i.e. lifetime risk) of inhibitor development is: \(^{WFH, 2012}\)

- 20 - 30% in severe haemophilia A
- 5 - 10% in mild or moderate haemophilia A
- <5% in haemophilia B

- Presence of inhibitors should be suspected in the following situations:
  o poor response to replacement therapy
  o recovery assays are not as expected
  o increase bleeding episodes despite optimal prophylaxis

Risk factors of inhibitor development are:

- high intensity treatment of clotting factor [FVIII concentrate >150 IU/kg/week within the first 8 - 12 weeks of therapy \( (HR=1.9, 95\% \text{ CI } 1.3 \text{ to } 2.8) \)] \(^{Marcucci M et al., 2016, level II-2}\)
- FVIII genotype - large deletions and nonsense mutations has higher risk compared with intron 22 inversions \( [\text{pooled } OR=3.6 \ (95\% \text{ CI } 2.3 \text{ to } 5.7) \text{ and } OR=1.4 \ (95\% \text{ CI } 1.1 \text{ to } 1.8) \text{ respectively}] \)^{Gouw SC et al., 2013, level II-2} \( \text{and } OR=1.4 \ (95\% \text{ CI } 1.1 \text{ to } 1.8) \text{ respectively}\)
- family history of inhibitors \( (RR=3.5, 95\% \text{ CI } 1.5 \text{ to } 8.1) \) \(^{Gouw SC et al., 2007, level II-2}\)

Regular prophylaxis is associated with a lower risk of inhibitor development than on-demand treatment. \(^{Gouw SC et al., 2013, level II-2; Gouw SC et al., 2007, level II-2}\)

- Inhibitor should be screened. \(^{WFH, 2012}\)
  o at regular interval
  o for children- once every five exposure days until 20 exposure days, then every 10 exposure days between 21 and 50 exposure days, then at least twice a year until 150 exposure days
  o for adults with >150 exposure days, every 6 - 12 months
  o after intensive treatment for >5 days, within 4 weeks of the last infusion
  o prior to surgery

8.1 Treatment of Acute Bleeding

The main treatment option for bleeding episodes in PWH with inhibitors is bypassing agents e.g. rFVIIa or aPCC. These agents bypass the coagulation pathway that normally utilises FVIII. aPCC should be used with caution in patients planned for ITI as it may cause anamnestic response with the rise of inhibitor levels.

rFVIIa and aPCC are equally effective and well tolerated with no increase in thromboembolic risk in the treatment of acute bleeding episodes in haemophilia with inhibitors. \(^{Matino D et al., 2015, level I}\)

The dose of rFVIIa is 90 - 120 µg/kg rounded up to the nearest vial size, given every 2 - 3 hours until haemostasis achieved. Equivalent effectiveness and safety have been demonstrated with a single dose of 270 µg/kg vs three doses of 90 µg/kg \(^{Matino D et al., 2015, level I}\)
aPCC can be used at doses of 50 - 100 IU/kg or given every 8 - 12 hours, but should not exceed 200 IU/kg/day. \(^{UKHDCG, 2017; Matino D et al., 2015, level I}\)
Home treatment with bypassing products is effective in haemostasis and safe with no serious adverse events. Holme PA, 2009, level II-3

**Recommendation 8**
- Bypassing agents should be used to treat acute bleeding in haemophilia with inhibitors.

### 8.2 Prophylaxis Therapy

There is a role for prophylaxis with bypassing agents in PWH with inhibitors. In a Cochrane systematic review:
- both bypassing agents as prophylaxis were significantly effective in reducing bleeding as compared with on-demand group
- there was lack of evidence on the superiority of one agent over the other
- there was no significant difference between high dose 270 μg/kg daily and low dose 90 μg/kg daily rFVIIa regimen in reducing overall bleeding and serious adverse events while the prophylaxis dose for aPCC is 85 ± 15 IU/kg three times a week or every other day

Prophylaxis can be considered after life-threatening bleed or in frequent bleeders. However, the high cost limits its use. Based on current local price, the estimated cost of prophylactic aPCC in a 50 kg patient is RM4.5 million/year (1 vial of 500 IU=RM2726).

Novel agents such as SC emicizumab, concizumab and fitusiran are being investigated as alternative prophylaxis for PWH with inhibitors. Emicizumab, a bispecific monoclonal antibody that bridges factor IXa and factor X, and given as a weekly SC injection has been approved by FDA.

### 8.3 Eradication of Inhibitors

The rationale for advocating immune tolerance induction (ITI) in PWH with inhibitor is because treatment with bypassing agents is suboptimal as compared with factor replacement therapy in PWH without inhibitor. Hence, eradication of inhibitor is important to put the patient back on prophylactic therapy with factor concentrate.

ITI is a therapy where repeated large doses of factor concentrate are administered over a period of weeks to years to induce antigen specific tolerance and reduce inhibitory antibodies. It is carried out until the antibodies disappear. There are different regimens consisting of various factor dosages with or without immune suppression. The success rate in haemophilia A is about 50 - 80% and haemophilia B 13 - 31%.

Initiation of ITI should be postponed until the inhibitor titre has dropped to <10 BU. An inhibitor titre of <10 BU immediately before ITI initiation positively affects both the likelihood of success and the time required to achieve tolerance. Consider starting ITI regardless of the inhibitor titre if:
- the inhibitor titre does not fall below 10 BU within a 1 - 2 year period of close observation or
- a severe life- or limb-threatening bleeding event occurs

- Prerequisite for starting ITI to ensure no interruption of treatment for best response:
  - commitment from PWH with inhibitor/care giver
  - good venous access
Table 11. Regimen for ITI

<table>
<thead>
<tr>
<th>Historic peak inhibitor titre</th>
<th>Regimen</th>
</tr>
</thead>
</table>
| <5 BU                         | • Start ITI at a dose of 50 IU/kg every other day  
|                               | • To control clinically significant breakthrough bleeds, escalate to daily treatment, then only increase the dose by increments of 50 IU/kg/day up to 200 IU/kg/day  
|                               | • If the inhibitor titre on this ITI regimen increases above 40 BU, increase dose immediately to 100 IU/kg/day. If the inhibitor titre increases above 200 BU, increase the dose immediately to 200 IU/kg/day  |
| >5 and <200 BU                | • Start ITI at a dose of 100 IU/kg/day  
|                               | • To control clinically significant breakthrough bleeds, escalate the dose by increments of 50 IU/kg/day up to 200 IU/kg/day  
|                               | • If the inhibitor titre rises to >200 BU, increase dose immediately to 200 IU/kg/day  |
| >200 BU                       | • Start ITI at a dose of 200 IU/kg/day  |

In a Cochrane systematic review, the time taken to eradicate inhibitor was shorter in the high dose regimen (200 IU/kg/day) as compared with low dose (50 IU/kg three times a week) resulting in less bleeding event (p=0.027). However there was no difference in successful tolerance between the two regimens (RR=1.07, 95% CI 0.68 to 1.68). Athale AH et al., 2014, level I

The off-label use of rituximab had been shown in some studies to be effective in eradicating inhibitors in haemophilia. A durable remission was achieved in 53.1% with no serious adverse reactions reported. The response was better in mild/moderate haemophilia and with concomitant treatment with factor VIII concentrates and immunosuppressive agents. Franchini M et al., 2008, level III

Recommendation 9
• Immune tolerance induction should be considered in all persons with haemophilia with inhibitor.

8.4 Transfusion-related Infection

PWH with HIV, Hepatitis B and Hepatitis C should be treated as per patients without haemophilia. PWH who have received plasma derived factors should be screened for these infections every 6 - 12 months or if clinically indicated. WFH, 2012

9. HOME THERAPY

Home therapy is part of haemophilia comprehensive care, where the administration of replacement therapy is done outside hospitals, with its safety and effectiveness closely supervised. Teitel JM et al., 2004, level III
Home therapy allows immediate access to clotting factor. The earlier the factor is initiated, ideally within two hours of bleeding onset, the faster the bleeding will resolve. PWH who practice home therapy has better QoL compared with those who do not. They have a lower risk of hospitalisation for bleeding (RR=0.8, 95% CI 0.7 to 0.9). Soucie JM et al., 2001, 8-2

<table>
<thead>
<tr>
<th>Requirements for home therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Initiation of home therapy should only be done after adequate education and training. This is followed by close supervision of its safety and efficacy. Education should include:</td>
</tr>
<tr>
<td>- general knowledge of haemophilia</td>
</tr>
<tr>
<td>- recognition of bleeds and common complications</td>
</tr>
<tr>
<td>- first aid measures</td>
</tr>
<tr>
<td>- dosage calculation, preparation, storage and administration of clotting factor concentrates</td>
</tr>
<tr>
<td>- aseptic techniques and venipuncture techniques (or access of central venous catheter)</td>
</tr>
<tr>
<td>- record keeping</td>
</tr>
<tr>
<td>- proper storage and disposal of needles/sharps, and handling of blood spills</td>
</tr>
</tbody>
</table>

E-learning programme improves knowledge and skills of PWH on home treatment (p=0.002). Mulders G et al., 2012, level I

**Recommendation 10**

- Home therapy should be advocated to all persons with haemophilia.

**Central venous access device**

It is essential to have patent venous access for factor delivery in PWH. Peripheral venous is the route of choice; however, central venous access would facilitate factor administration in young children with small and difficult veins. WFH, 2012

Central venous access device (CVAD) is indicated in PWH with difficult venous access who require immune tolerance induction therapy or prophylaxis. Vepsäläinen K et al., 2015, level III

Despite its benefits, CVAD usage in haemophilia should be approached cautiously because of their potential complications e.g. risk of surgery, infection, mechanical complication and thrombosis. Vepsäläinen K et al., 2015, level III; WFH, 2012

Arteriovenous fistula is a feasible venous access in haemophilia with an acceptable rate of complications. Mancuso ME et al., 2009, level II-2

Risk factors for CVAD infections are:

- patient with inhibitors at insertion (p=0.004) Vepsäläinen K et al., 2015, level III
- age under six years at the time of insertion CVAD Ewenstein BM et al., 2004, level III
- external catheter use Ewenstein BM et al., 2004, level III

**10. ADHERENCE IN HAEMOPHILIA TREATMENT**

Adherence is defined as the extent to which a person's behaviour on taking medication, following diet, and/or executing lifestyle changes corresponds with agreed recommendations from a healthcare provider. WHO, 2003, level III

Life-long dedication and adherence to prophylactic therapy is crucial to prevent bleeding and maintain good health in PWH.
a. Factors influencing adherence

- Motivators for haemophilia treatment adherence:
  - experience of symptoms (p<0.05) \( \text{Schrijvers LH et al., 2013, level III} \)
  - good relationship with healthcare providers (p<0.001) \( \text{Schrijvers LH et al., 2013, level III} \)
  - positive belief in necessity of treatment (p<0.01) \( \text{Schrijvers LH et al., 2013, level III} \)
  - haemophilia perceived as a highly chronic condition (p=0.003) \( \text{Lamiani G et al., 2015, level III} \)
  - less negative emotions (p=0.023) \( \text{Lamiani G et al., 2015, level III} \)

- Barriers for haemophilia treatment adherence:
  - absence or infrequent symptoms
  - increasing age (older patients) (p=0.002)

b. Measures to improve adherence

- Ensure adequate time and resources are allocated for family adherence education. \( \text{Witkop ML et al., 2016, level II-2} \)
- Promote interventions aiming at patient’s acceptance of their chronic condition. \( \text{Lamiani G et al., 2015, level III} \)
- Target young adults as they are transitioning from adolescence and would assume primary responsibility for their haemophilia care. \( \text{Witkop ML et al., 2016, level II-2} \)

c. Haemophilia Medication Therapy Adherence Clinic (HMTAC) \( \text{HMTAC Handbook, 2016, level III} \)

- Haemophilia Medication Therapy Adherence Clinic (HMTAC) is an adherence programme in Malaysia where trained pharmacists assist PWH and caregivers based on structured modules to:
  - understand haemophilia and its treatment
  - identify healthy lifestyle decisions which may impact bleeding tendencies and factor concentrate use
  - utilise HMTAC team members for queries or feedback problems
  - maintain good attendance at work or school

- Objectives and benefits of HMTAC include:
  - to help PWH understand and treat haemophilia
  - to support PWH and their family, through continuous supervision of all pharmacotherapy related to bleeding disorders
  - to educate and empower PWH to be independent and be able to do home therapy
  - to lower morbidity and to provide cost-effective care in the long-term

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Recommendation 11

- Haemophilia Medication Therapy Adherence Clinic should be made available in all haemophilia treatment centres.

11. SPECIAL SITUATIONS

11.1 Surgeries and Invasive Procedures

Surgeries for PWH require additional planning and multidisciplinary collaboration. It is best managed at or in consultation with a comprehensive HTC and the following requirements need to be considered: \( \text{WFH, 2012} \)

- surgery is scheduled early in the week and early in the day for optimal laboratory and blood bank support
- anaesthesiologist involved has experience in treating patients with bleeding disorders
- adequate laboratory support for monitoring factor level and inhibitor testing
adequate quantities of factor concentrates must be available peri-operatively and during the duration of healing and/or rehabilitation.

Pre-operatively, inhibitor screening and inhibitor assay must be carried out, particularly if the recovery of the replaced factor is less than expected.\textsuperscript{WFH, 2012}

Surgical procedures can be either major or minor. A major procedure is defined as one that requires haemostatic support for a period exceeding five consecutive days.\textsuperscript{WFH, 2012} It often refers to major abdominal, intracranial, CV, spinal, major orthopaedic (e.g. joint replacement) and any other surgery with risk of large volume blood loss or blood loss into a confined anatomical space. In children this may include adenoid-tonsillectomy. Minor surgery refers to removal of skin lesions, arthroscopy, minor dental procedures and dental extractions.\textsuperscript{AHGDO, 2010, level III}

Infusion of factor concentrates is also necessary before invasive procedures e.g. lumbar puncture, arterial blood gas or any endoscopy with biopsy.\textsuperscript{WFH, 2012}

The dosage and duration of factor concentrate coverage depends on the type of surgery performed (refer to Table 10).

11.2 Management of Pregnant Carrier

The care of known carriers of haemophilia should be undertaken by obstetric unit in close liaison with a haemophilia care centre. A written management plan should include the haemostatic management of the mother and baby.\textsuperscript{Chalmers E et al., 2011, level III}

Gender identification should be known during antenatal period by US scan between 18 and 20 weeks. Foetal gender can also be determined by maternal blood sampling at around 10 weeks gestation. If the foetus is found to be male, the diagnosis of haemophilia maybe confirmed by amniocentesis to decide the management at delivery.\textsuperscript{Chalmers E et al., 2011, level III} In local setting, these tests are available in some private laboratories.

FVIII level should be measured in carriers during the third trimester of pregnancy and if it is <50 IU/dL, clotting factor replacement is necessary for surgical or invasive procedures during delivery.\textsuperscript{WFH, 2012}

In a meta-analysis, delivery of infants with known or suspected haemophilia should be atraumatic, regardless whether it is vaginal or caesarean, to decrease the risk of bleeding.\textsuperscript{Davies J et al., 2016, level II-2}

- Cranial bleeding occurred with a significantly higher frequency in newborns with haemophilia compared with the general population i.e.:
  - ICH: OR=44, 95% CI 34.7 to 57.1
  - extracranial haemorrhage: OR=8.2, 95% CI 5.38 to 12.6
- In newborns with haemophilia, delivery by a caesarean section was associated with the lowest risk of ICH (OR=0.34, 95% CI 0.14 to 0.83).
- Assisted vaginal delivery (forceps and vacuum extraction) increased the risk of ICH (OR=4.39, 95% CI1.46 to 13.7).

The care of known carriers of haemophilia should involve a multidisciplinary team with expertise in haemophilia care.

Route of delivery in haemophilia carriers should be as per obstetric indications.

Assisted vaginal delivery and invasive procedures should be avoided in male foetus.
Intramuscular (IM) vitamin K and Hepatitis B vaccination should be withheld until haemophilia is excluded. Oral vitamin K should be given if there is a delay in diagnosis or if haemophilia is confirmed. Chalmers E et al, 2011, level III

- In view of limitation of laboratory services in the local setting, the management of a male newborn of a carrier mother are as follow:
  - newborn is assumed to have haemophilia until proven otherwise
  - oral vitamin K should be given instead of IM vitamin K
  - hepatitis B vaccination should be given subcutaneously
  - venous sampling for APTT and factor assay should be done as soon as possible to confirm haemophilia

11.3 Vaccination

Patients with bleeding disorders should receive the recommended vaccinations for their age group. However, these vaccinations should be given subcutaneously rather than intramuscularly to reduce the injection site complications. WFH, 2012

Hepatitis B vaccination by SC route is as effective as IM route. Carpenter SL et al., 2015, level III

**Recommendation 12**
- All injectable vaccinations in haemophilia should be given subcutaneously.

11.4 Circumcision

Circumcision is not absolutely contraindicated in PWH but should be performed cautiously by the surgeon in liaison with the haematologist in a haemophilia care centre. However, it should be taken into consideration that bleeding and other complications maybe more serious in those with inhibitors.

Fibrin glue is a topical, biological sealant which stimulates the final stages of coagulation. It diminishes the risk of post-operative bleeding and reduces the need of factor replacement therapy. Sasmaz I et al., 2011, level III; Avanoglu A et al., 1999, level II-2

- Muzakarah Jawatankuasa Fatwa Majlis Kebangsaan Bagi Hal Ehwal Ugama Islam Malaysia Kali Ke-77 has decided that circumcision in PWH is considered life-threatening and hence it is not obligatory. JAKIM, 2007

12. DENTAL CARE

12.1 Preventive Dental Measures

Routine dental examination with preventative care should be conducted regularly. Anderson et al., 2013, level III; WFH, 2012

In PWH, it should be initiated at the time the baby teeth start to erupt.

Good oral hygiene practice helps to prevent periodontal disease (gum disease), dental caries, gum bleeding and the need for dental extraction. Brushing teeth twice a day (using soft bristles toothbrush) with toothpaste containing fluoride will remove plaque deposits.
Dental floss or interdental brushes should be used wherever possible. WFH, 2012

Properly designed and implemented oral health educational programmes are helpful to make positive changes in oral health of PWH. Evangelista et al., 2015, level III; Gaddam et al., 2014, level II-3; Rajantie et al., 2013, level III; Kabil et al., 2007, level II-1 Dietary counselling including reduce sugary intake should be part of the oral health advice for PWH.

**Recommendation 13**
- In person with haemophilia,
  - routine dental examination with preventive care should be conducted regularly
  - good oral hygiene practice and dietary counselling should be advocated to prevent dental diseases

### 12.2 Dental Procedures

Effective and safe dental procedures should be a priority in PWH. A multidisciplinary approach involving dental surgeon and haemophilia team is important for comprehensive oral health care. Anderson JA et al., 2013, level III; WFH, 2012. Before performing any invasive dental or surgical procedures, the dental surgeon must liaise with the haematologist inorder to prevent or minimise potential bleeding or infection risks. Careful planning for haemostatic cover is crucial for PWH with inhibitors. WFH, 2012 With respect to local anaesthetic (LA) and factor replacement therapy the recommendations is as stipulated in Table 12. Anderson JA et al., 2013, level III

<table>
<thead>
<tr>
<th>Procedures that do not require factor cover (applies to adult patients only). Paediatric patients may receive factor replacement therapy before local anaesthetic infiltration as advised by haematologist.</th>
<th>Procedures that require factor cover (applies to both adult and paediatric patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labial/buccal infiltration</td>
<td>Inferior dental block/ mandibular block</td>
</tr>
<tr>
<td>Intra-papillary injection</td>
<td>Lingual infiltration</td>
</tr>
<tr>
<td>Intra-ligamentary injections</td>
<td></td>
</tr>
</tbody>
</table>

PWH must seek immediate care from the haemotologist/dental surgeon post-operatively if one of these events occur: WFH, 2012
- prolonged bleeding
- difficulty in speaking
- difficulty in swallowing
- difficulty in breathing

Refer to Subchapter 5.2.3 on Analgesia.

Malocclusion e.g. overcrowding teeth may lead to periodontal (gum) disease if left untreated. The advantage of having well-aligned teeth includes easier cleaning of teeth and gum for better oral hygiene. MAO, 2016 Therefore, an orthodontic assessment for PWH should be considered between the ages of 10 - 14 which is during the late mixed to early permanent dentition stages. WFH, 2012

**Recommendation 14**
- Comprehensive oral health care in haemophilia should be performed by multidisciplinary team which include dental surgeon.
12.3 Management of Oral Bleeding

Causes of oral bleeding in PWH include:
- eruption of permanent teeth with exfoliation of baby teeth \cite{Scully et al., 2008, level III}
- gingival/gum bleeding associated with poor oral hygiene \cite{WFH, 2012}
- trauma \cite{WFH, 2012}
- invasive dental procedures e.g. dental extractions, surgical procedures, etc. \cite{WFH, 2012}

In children with haemophilia, the surrounding gum may appear bluish and swollen when the baby teeth are erupting or teething. Normally, these conditions do not bleed. Therefore, it is suggested allowing the baby teeth to self-exfoliate in order to minimise risk of bleeding. \cite{Scully et al., 2008, level III}

In local setting, extraction may be indicated when the baby tooth is mobile and bleeds. The need for factor coverage should be discussed with the haematologist.

The type of dental procedures significantly affects the bleeding outcome and can be categorised according to risk of bleeding. High-risk procedure shave higher bleeding outcome compared with low-risk procedures (OR=8.97, 95% CI 3.5 to 23). The risk of bleeding in dental procedures is shown in Table 13. \cite{Givoli N et al., 2015, level III}

Refer to Subchapter 7.3 on Pseudotumour.

### Table 13. Dental procedures and risk of bleeding

<table>
<thead>
<tr>
<th>Level of risk</th>
<th>Type of dental procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-risk</td>
<td>Flap elevation</td>
</tr>
<tr>
<td></td>
<td>Teeth extractions</td>
</tr>
<tr>
<td></td>
<td>Crown lengthening procedure</td>
</tr>
<tr>
<td></td>
<td>Soft tissue biopsy</td>
</tr>
<tr>
<td></td>
<td>Scaling and/or root planning</td>
</tr>
<tr>
<td></td>
<td>Inferior alveolar nerve block</td>
</tr>
<tr>
<td>Low-risk</td>
<td>Restorative treatment e.g. filling, crown, bridge, etc.</td>
</tr>
<tr>
<td></td>
<td>Prosthodontics treatment e.g. denture fabrication, root canal treatment, etc.</td>
</tr>
<tr>
<td></td>
<td>Orthodontic treatment</td>
</tr>
</tbody>
</table>

Antifibrinolytic agents e.g. TXA and epsilon aminocaproic acid therapy administered systemically in PWH undergoing minor oral surgery or dental extraction are beneficial in preventing post-operative bleeding (RD= -0.57, 95% CI -0.76 to -0.37). The antifibrinolytic agents reduce the need for clotting factor concentrates and post-operative bleeding. No significant adverse events have been reported. \cite{van Galen KP et al., 2015, level I}

Antifibrinolytic therapy in the form of TXA 5% weight/volume mouthwash (four times a day) should be kept in the mouth for two minutes before discarding. \cite{Rasarainam L et al., 2017, level III}

Oral TXA and/or 5% TXA mouthwash should be prescribed alone or in combination pre- and post-dental extraction for up to seven days. \cite{Anderson JA et al., 2013, level III}

TXA mouthwash should not be given to younger children as they may inadvertently swallow it, leading to overdosage. \cite{Anderson JA et al., 2013, level III}

In local setting, compression of the bleeding area using gauze soaked with diluted TXA (TXA 500 mg diluted in 10 ml of distilled water) is used until bleeding stops.

In PWH undergoing dental extractions, bleeding may be minimised by using either resorbable or non-resorbable sutures, surgical splints and other additional local measures. \cite{Anderson JA et al., 2013, level III}

Factor replacement may be required for PWH according to the haematologist’s care plan. \cite{WFH, 2012}
The relative risk of bleeding in PWH depends on the types of dental procedures. Antifibrinolytic therapy reduces the need for clotting factor concentrate and post-operative oral bleeding.

13. MONITORING

Haemophilia care involves managing PWH from birth (and even before) until adulthood. With the introduction of new treatment strategies and the emergence of new tools to evaluate the medical and social consequences, clinical follow-up of PWH has become more complex.

Regular and standardised evaluation should be done at least 12-monthly so that problems are identified early and treatment modified accordingly. The parameters to monitor are:
- inhibitors
- bleed frequency
- joint health
- radiological measures

13.1 Inhibitors

Refer to Chapter 8 on Inhibitors.

13.2 Bleeding Frequency

Bleeding pattern is the key parameter to evaluate the efficacy of treatment strategy and thus, information on bleeding episodes should be thoroughly documented. Issues related to haemostasis (bleed record) should be evaluated.

Standard assessment of bleed frequency includes Annual Bleeding Rate (ABR), which is the number of bleeds collected over 12 consecutive months. In addition to ABR, annual joint bleed rates (AJBR) should be specified.

ABR is calculated based on the following formula:

\[
\text{ABR} = \frac{\text{Number of bleeding events}}{\text{(Number of days receiving treatment/365.25 days)}}
\]

Information to be recorded on haemarthrosis and other types of bleeding are:
- number of episodes
- time and site of each bleed
- provoked (i.e. traumatic) or spontaneous bleed
- target joint or non-target joint bleed
- dose, number, interval and response to factor administration

In PWH treated with early prophylaxis, self-reported bleeding does not significantly correlate with any other outcome parameters (ABR with HJHS: \(r=0.107\); Fuctional Independence Score in Haemophilia (FISH): \(r=0.300\); Pettersson scores: \(r=0.016\); Arnold-Hilgartner (AH) scores: \(r=0.081\); and additive and progressive scores: \(r=0.073\) and 0.066 respectively).
In addition to self-reported bleeding, outcome assessment in PWH on long-term prophylaxis should include objective joint assessment, assessment of activities and health-related QoL.

Fischer K et al., 2016, level III (b)

13.3 Joint Health

Preservation of good joint status is an important component of haemophilia care. The HJHS is a clinical measure of joint structure and function. It is more efficient than WFH score at differentiating:  

- severe from mild and moderate haemophilia (97%, p=0.003)
- subjects treated with prophylaxis from those treated on-demand (74%, p=0.003)

Inter-physiotherapist discrepancies in routine HJHS has shown to hamper comparison of scores between treatment regimens. Nijdam A et al., 2015, level III Thus, training of physiotherapist on HJHS score is essential.

HJHS may be used safely as a first-line tool for monitoring of joint health as it has significantly strong correlation with radiological scores (r=0.67), moderate correlation with physical domains of the SF-36 (r= -0.50), utility (r= -0.41), and MRI scores (r=0.444 with additive score and r=0.440 with progressive score).

It is recommended to do HJHS at least once a year. de Moerloose P et al., 2011, level III Refer to Appendix 8 on HJHS Score.

13.4 Radiological Measures

Diagnostic imaging provides objective information on the joint status in PWH.

In PWH on prophylaxis, imaging of the six major joints (knees, ankles and elbows) should be considered at the age of eight years or before if clinically indicated. Usual interval is at 4- to 5-year intervals. de Moerloose P et al., 2011, level III

When using conventional radiography for assessment, WFH recommends the use of Pettersson score. WFH, 2012 The Pettersson scoring system has excellent reliability when used by radiologists experienced in reading musculoskeletal images. It can be used for assessment of advanced osteochondral changes. Fischer K et al., 2016, level III (a) Refer to Appendix 9 on Pettersson Score.

MRI and US can detect early soft-tissue and osteochondral changes in a joint before they become apparent on physical examination or plain radiographs. Fischer K et al., 2016, level III (a)

A systematic review showed that US had the ability to detect pathological changes e.g. synovial thickening and osteochondral abnormalities in haemophilic joints. There was association between US findings and functional status of the joint. However, its ability to detect a change in arthropathy with therapy was yet to be determined. Ligocki CC, 2017, level III

The current practice of prescribing clotting factor or conservative measures based on pain perception seems inadequate. There are discrepancies between musculoskeletal US findings and patient/physician-perceived pain aetiology. Only approximately one third of the painful musculoskeletal episodes are judged correctly either by the patient or physician. Thus, US should be part of the assessment when PWH present with musculoskeletal pain. Ceponis A et al., 2013, level III

In a systematic review on MRI as a tool for evaluating haemophilic arthropathy in children, MRI had good diagnostic accuracy for discriminating the presence of arthropathy. The
association between early MRI findings and long-term functional joint outcomes was yet to be determined. 

Chan MW, 2013, level II-2

<table>
<thead>
<tr>
<th>Recommendation 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring of care in person with haemophilia should include:</td>
</tr>
<tr>
<td>o Annual Bleeding Rate</td>
</tr>
<tr>
<td>o inhibitor screening*</td>
</tr>
<tr>
<td>o Annual Haemophilia Joint Health Score</td>
</tr>
<tr>
<td>o ultrasound (knee, ankle, elbow) when feasible</td>
</tr>
</tbody>
</table>

*Refer to Chapter 8 on Inhibitor.

14. IMPLEMENTING THE GUIDELINES

The management of haemophilia should be guided by evidence-based approach in order to provide quality care to the patients. Several factors may affect the implementation of recommendations in the CPG.

14.1 Facilitating and Limiting Factors

Existing facilitators for application of the recommendations in the CPG include:

a. wide dissemination of the CPG to healthcare providers (hard- and soft-copies)
b. regular topic update for healthcare providers via continuous medical education (seminar/conference/course)
c. National Haemophilia Programme
d. involvement of governmental/NGOs e.g. World Haemophilia Day, Haemophilia Camp, etc.
e. accessibility to relevant multidisciplinary teams

Existing barriers for application are:

a. poor understanding/limited knowledge on the topic
b. insufficient resources in terms of budget, expertise, diagnostic tools, medications
c. no national registry
d. variation in clinical management and preferences
e. low priority on the issue by the stakeholders

14.2 Potential Resource Implications

To implement the CPG, there must be strong commitment to:

a. ensure widespread distribution of the CPG to health care personnel via printed copies, electronic websites, etc.
b. reinforce training of health care personnel by regular seminars or workshops to ensure information is made available
c. develop multidisciplinary teams at hospital and community level to include involvement of specialists, medical/dental officers, pharmacists, allied health professional and nurses
d. ensure screening and monitoring facilities, and medications are available at HTC
e. ensure widespread distribution of patient education materials

The following is proposed as clinical audit indicator for quality management of haemophilia:

\[
\text{Percentage of prophylactic factor infusion given to person} = \frac{\text{Total number of person with severe haemophilia receiving } X}{100}\%
\]
with severe haemophilia  prophylaxis factor infusion in a year

Total number of person with severe haemophilia in the same year

\[
\text{Percentage of monitoring* done in PWH} = \frac{\text{Total number of PWH being monitored* in a year}}{\text{Total number of PWH in a year}} \times 100\%
\]

*Monitoring by ABR, inhibitor screening and HJHS

Implementation strategies will be developed following the approval of the CPG by MoH which include launching of the CPG, Quick Reference and Training Module.
References

3. Steve Keeney, Mike Mitchell and Anne Goodeve. Practice Guidelines for the Molecular Diagnosis of Haemophilia A. UK Haemophilia Centre Doctors’ Organisation (UKHCDO), the Haemophilia Genetics Laboratory Network and the Clinical Molecular Genetics Society (2010).
4. Steve Keeney, Mike Mitchell and Anne Goodeve. Practice Guidelines for the Molecular Diagnosis of Haemophilia B. UK Haemophilia Centre Doctors’ Organisation (UKHCDO), the Haemophilia Genetics Laboratory Network and the Clinical Molecular Genetics Society (2010).
32. Ministry of Health, Malaysia, Pain Medication Therapy Management Service: Guideline for Pharmacy, 2018
49. Holme PA, Glimstein A, Grenhaug S, Tjønnfjord GE. Home treatment with bypassing products in
Appendix 1

EXAMPLE OF SEARCH STRATEGY

Clinical Question: What are the effective and safe treatments for in haemophilia?

1. HEMOPHILIA A/
2. congenital hemophilia a.tw.
3. hemophilia a.tw.
4. hemophilia.tw.
5. haemophilia.tw.
6. HEMOPHILIA B/
7. christmas disease.tw.
8. ((f9 or factor ix) adj deficienc*).tw.
9. ((haemophilia or hemophilia) adj b).tw.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. FACTOR VIIA/
12. (activated adj1 factor vii).tw.
13. (coagulation adj1 factor viia).tw.
14. factor viia.tw.
15. Novoseven.tw.
16. activated blood coagulation factor vii.tw.
17. Factor Eight Inhibitor Bypassing Agent.tw.
19. Activated PCC.tw.
20. aPCC.tw.
21. Immune Tolerance/
22. Immune Tolerance.tw.
23. 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22
24. 10 and 23
25. limit 24 to English language and humans
Appendix 2

CLINICAL QUESTIONS

1. What are the clinical presentations of haemophilia?
2. What are the accurate laboratory tests for haemophilia?
3. What are the accurate laboratory tests for inhibitor detection in haemophilia?
4. Who and what tests should be done for haemophilia screening?
5. What are the general principles of care in haemophilia?
6. Are the following non-pharmacological treatments effective and safe in haemophilia?
   - Rehabilitation for musculoskeletal
   - PRICE
   - Joint protection
   - Sports/physical activity
   - Post-operative care
7. Are the following pharmacological treatments effective and safe in haemophilia?
   - Factors - Plasma Derived Factors, Recombinant
   - Adjuvant - Desmopressin, Tranexamic acid, Others
8. What are the effective and safe treatments for pain in haemophilia?
9. What are the effective and safe treatments for acute bleeding in various body systems in haemophilia?
   - Central Nervous System
   - Joint
   - Muscles
   - Nose, throat and eye
   - Gastrointestinal tract
   - Genitourinary tract
10. What are the effective and safe treatments for complications in haemophilia?
    - Synovitis
    - Pseudotumour
    - Inhibitors
11. What are the benefits and requirements for home therapy in haemophilia?
12. What are the factors to improve adherence/compliance in haemophilia treatment?
13. What are the management in the following special situations of haemophilia?
    - Surgeries and Invasive Procedures
    - Delivery of Infant with Known/Suspected Haemophilia
    - Vaccination
    - Circumcision
14. What are the effective and safe preventive measures for oral diseases in haemophilia?
15. What are the effective and safe dental procedures in haemophilia?
16. What are the effective and safe methods for the management of oral bleeding in haemophilia?
17. How to monitor effectively and safe the following parameters in haemophilia on treatment?
    - Inhibitors
    - Bleeding frequency
    - Joint health
    - Radiological measures
<table>
<thead>
<tr>
<th>Variables</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient identification</td>
<td>• Ensure correct patient identification</td>
</tr>
<tr>
<td>Venepuncture</td>
<td>• Non-traumatic venepuncture</td>
</tr>
<tr>
<td></td>
<td>• Avoid drawing blood from indwelling IV line</td>
</tr>
<tr>
<td></td>
<td>• Avoid inappropriately narrow gauge needle</td>
</tr>
<tr>
<td></td>
<td>• Avoid capillary blood</td>
</tr>
<tr>
<td>Condition</td>
<td>• Relaxed and in warm surroundings</td>
</tr>
<tr>
<td>Pressure cuff</td>
<td>• Withdraw blood without pressure cuff, if possible. If need to use pressure cuff, do not apply more than one minute.</td>
</tr>
<tr>
<td>Tube and anticoagulant</td>
<td>• 3.2 % sodium citrate anticoagulant tube. Citrate tubes must be properly filled.</td>
</tr>
<tr>
<td></td>
<td>• Once drawn, the tube should be gently inverted five times.</td>
</tr>
<tr>
<td>Ratio</td>
<td>• Anticoagulant/blood ratio is 1:9.</td>
</tr>
<tr>
<td>Time</td>
<td>• The sample must reach the laboratory within three hours of collection.</td>
</tr>
<tr>
<td>If test is outsourced to referral laboratory</td>
<td>• Freeze platelet-free plasma. Specimens can be stored at -20°C for up to two weeks or at -70°C for up to six months.</td>
</tr>
<tr>
<td></td>
<td>• Transport the frozen specimen with ice-pack or dried-iced immediately to referral laboratory.</td>
</tr>
</tbody>
</table>
Appendix 4

RECOMMENDED SPORTS/PHYSICAL ACTIVITIES IN HAEMOPHILIA

Different sports/physical activities carry different risks in PWH. It is important to understand these risks in order to choose the appropriate sports/physical activities as shown in the table below. Levels 1 - 2 indicate that the benefits of these sports/physical activities outweigh the associated risks. All sports rated 3 are not recommended for PWH.

### Activity Category

<table>
<thead>
<tr>
<th>Activity Category</th>
<th>Safe</th>
<th>Safe to moderate risk</th>
<th>Moderate risk</th>
<th>Moderate to dangerous risk</th>
<th>Dangerous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobics</td>
<td>1</td>
<td>1.5</td>
<td>2</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>Archery</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquatics</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseball</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Basketball</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycling</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMX Racing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Bowling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boxing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Canoeing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>CV Training Equipment</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• Elliptical Machine</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Rowing Machine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ski Machine</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Stationary Bike</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>• Stepper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>• Treadmill</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheerleading</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>Circuit Training</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Diving/Competitive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Diving/Recreational</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Exercise Classes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Body Sculpting</td>
<td></td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cardio Kick-Boxing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>• Physioball</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Spinning</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fishing</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Football</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Frisbee</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frisbee Golf</td>
<td></td>
<td></td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultimate Frisbee</td>
<td></td>
<td></td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golf</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gymnastics</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hiking</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>Hockey (Field, Ice, Street)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Horseback Riding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.5</td>
</tr>
</tbody>
</table>

The following is the list of sports/physical activities with the related coding:
<table>
<thead>
<tr>
<th>Activity</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice-Skating</td>
<td>2.5</td>
</tr>
<tr>
<td>Inline Skating</td>
<td>2.5</td>
</tr>
<tr>
<td>Jet Skiing</td>
<td>2.5</td>
</tr>
<tr>
<td>Jumping Rope</td>
<td>2</td>
</tr>
<tr>
<td>Kayaking</td>
<td>2.5</td>
</tr>
<tr>
<td>Lacrosse</td>
<td>3</td>
</tr>
<tr>
<td>Martial Arts - Karate/Kung Fu/Tae Kwon Do</td>
<td>2.5</td>
</tr>
<tr>
<td>Martial Arts/Tai Chi</td>
<td>1</td>
</tr>
<tr>
<td>Motorcycling/Motor Cross Racing</td>
<td>3</td>
</tr>
<tr>
<td>Mountain Biking</td>
<td>2.5</td>
</tr>
<tr>
<td>Pilates</td>
<td>1.5</td>
</tr>
<tr>
<td>Power Lifting</td>
<td>3</td>
</tr>
<tr>
<td>Racquetball</td>
<td>2.5</td>
</tr>
<tr>
<td>River Rafting</td>
<td>2.5</td>
</tr>
<tr>
<td>Rock Climbing</td>
<td>3</td>
</tr>
<tr>
<td>Rock Climbing (Indoor/Challenge Course)</td>
<td>2</td>
</tr>
<tr>
<td>Rock Climbing (Natural Setting)</td>
<td>3</td>
</tr>
<tr>
<td>Rodeo</td>
<td>3</td>
</tr>
<tr>
<td>Roller-skating</td>
<td>2</td>
</tr>
<tr>
<td>Rowing/Crew</td>
<td>2</td>
</tr>
<tr>
<td>Rugby</td>
<td>3</td>
</tr>
<tr>
<td>Running and Jogging</td>
<td>2</td>
</tr>
<tr>
<td>Scooter (Motorised)</td>
<td>3</td>
</tr>
<tr>
<td>Scooter (Non-motorised)</td>
<td>2.5</td>
</tr>
<tr>
<td>Scuba Diving</td>
<td>2.5</td>
</tr>
<tr>
<td>Skateboarding</td>
<td>2.5</td>
</tr>
<tr>
<td>Skiing/Cross Country</td>
<td>2</td>
</tr>
<tr>
<td>Skiing/Downhill</td>
<td>2.5</td>
</tr>
<tr>
<td>Skiing/Telemark</td>
<td>2.5</td>
</tr>
<tr>
<td>Snorkelling</td>
<td>1</td>
</tr>
<tr>
<td>Snowboarding</td>
<td>2.5</td>
</tr>
<tr>
<td>Snowmobiling</td>
<td>3</td>
</tr>
<tr>
<td>Soccer</td>
<td>2.5</td>
</tr>
<tr>
<td>Softball</td>
<td>2.5</td>
</tr>
<tr>
<td>Surfing</td>
<td>2.5</td>
</tr>
<tr>
<td>Swimming</td>
<td>1</td>
</tr>
<tr>
<td>T-Ball</td>
<td>2</td>
</tr>
<tr>
<td>Tennis</td>
<td>2</td>
</tr>
<tr>
<td>Track and Field</td>
<td>2.5</td>
</tr>
<tr>
<td>Trampoline</td>
<td>3</td>
</tr>
<tr>
<td>Volleyball</td>
<td>2.5</td>
</tr>
<tr>
<td>Walking</td>
<td>1</td>
</tr>
<tr>
<td>Water-skiing</td>
<td>2.5</td>
</tr>
<tr>
<td>Weight Lifting/Resistance Training</td>
<td>1.5</td>
</tr>
<tr>
<td>Weight Lifting/Power Lifting</td>
<td>3</td>
</tr>
<tr>
<td>Wrestling</td>
<td>3</td>
</tr>
<tr>
<td>Yoga</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: National Hemophilia Foundation, for all bleeding and clotting disorders, Playing it Safe, Bleeding Disorders, Sports and exercise. 2005 (Available at: https://www.hemophilia.org/sites/default/files/document/files/Playing-It-Safe.pdf)
## DEVELOPMENT OF ABNORMAL POSTURE FOLLOWING BLEEDS

<table>
<thead>
<tr>
<th><strong>Joint bleeds</strong></th>
<th><strong>Position of comfort</strong></th>
<th><strong>Habitual posture</strong></th>
<th><strong>Potential problems</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee</td>
<td>Flexion</td>
<td>Walking on flexed knee, with hip flexed and/or ankle plantarflexed to compensate</td>
<td>Pain in patellofemoral joint; stress on ankle; overuse of hamstrings; weak quadriceps</td>
</tr>
<tr>
<td>Elbow</td>
<td>Flexion</td>
<td>Loss of elbow extension, arm may be carried with shoulder extended</td>
<td>Eventual difficulty with forward elevation of the arm</td>
</tr>
<tr>
<td>Ankle</td>
<td>Plantarflexion</td>
<td>Walking on toes, with knee and/or hip flexed to compensate</td>
<td>Ankle in unstable position, with small area of weight-bearing on talus and sole of foot; overuse of calf muscles; pressure on knee</td>
</tr>
<tr>
<td>Hip (unusual site)</td>
<td>Flexion, external rotation</td>
<td>Hip flexed, increased lumbar lordosis, compensatory knee flexion</td>
<td>Incomplete hip extension during gait; compensation with increased rotation of pelvis or spine</td>
</tr>
<tr>
<td>Shoulder</td>
<td>Adduction, internal rotation</td>
<td>Arm held close to body</td>
<td>Difficulty with ADL and self-care</td>
</tr>
<tr>
<td>Wrist and fingers</td>
<td>Flexion</td>
<td>Wrist flexed, hand closed</td>
<td>Difficulty extending wrist and fingers; inefficient grip</td>
</tr>
<tr>
<td>Toes</td>
<td>Extension (dorsiflexion)</td>
<td>Extension (dorsiflexion)</td>
<td>Difficulty wearing shoes</td>
</tr>
</tbody>
</table>

### Muscle bleeds

<table>
<thead>
<tr>
<th><strong>Muscle bleeds</strong></th>
<th><strong>Position of comfort</strong></th>
<th><strong>Habitual posture</strong></th>
<th><strong>Potential Problems</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamstrings</td>
<td>Knee, flexion, hip extension</td>
<td>Knee flexed</td>
<td>Altered gait; knee flexed, walking on toes</td>
</tr>
<tr>
<td>Biceps brachii</td>
<td>Elbow flexion, shoulder internal rotation</td>
<td>Elbow flexed</td>
<td>Incomplete elbow extension; decreased protective balance reactions</td>
</tr>
<tr>
<td>Calf (gastrocnemius)</td>
<td>Ankle plantarflexion, knee flexion</td>
<td>Ankle plantarflexed, knee flexed</td>
<td>Walking on toes, knee flexed; stress on knee and ankle joints</td>
</tr>
<tr>
<td>Hip flexor (iliopsoas)</td>
<td>Hip flexion, some external rotation and increased lumbar lordosis</td>
<td>Hip flexed, extreme lordosis, walking on toes</td>
<td>Back pain; incomplete hip extension; stress on knee and ankle</td>
</tr>
<tr>
<td>Wrist and finger flexors</td>
<td>Wrist and finger flexion, elbow flexion</td>
<td>Wrist and finger flexion, elbow flexion</td>
<td>Inability to open hand; weak grip due to incomplete wrist extension</td>
</tr>
<tr>
<td>Thigh (quadriceps)</td>
<td>Knee extension</td>
<td>Knee remains extended</td>
<td>Incomplete knee flexion; risk of re-injury with sudden knee flexion; functional difficulties on stairs, squatting, etc.</td>
</tr>
<tr>
<td>Hip extensors</td>
<td>Hip extension</td>
<td>Hip extension</td>
<td>Unable to sit</td>
</tr>
<tr>
<td>Wrist and finger extensors</td>
<td>Wrist and finger extension, elbow flexion</td>
<td>Wrist and finger extension, elbow flexion</td>
<td>Unable to grasp</td>
</tr>
</tbody>
</table>

## FACE, LEGS, ACTIVITY, CRY, CONSOLABILITY (FLACC) SCALE

### CATEGORIES | SCORING
---|---|---
**Face** | No particular expression or smile | Occasional grimace or frown, withdrawn, disinterested | Frequent to constant quivering chin, clenched jaw
**Legs** | Normal position or relaxed | Uneasy, restless, tense | Kicking or legs drawn up
**Activity** | Lying quietly, normal position, moves easily | Squiring, shifting back and forth, tense | Arched, rigid or jerking
**Cry** | No cry (awake or asleep) | Moans or whimpers; occasional complaint | Crying steadily, screams or sobs, frequent complaints
**Consolability** | Content, relaxed | Reassured by occasional touching, hugging or being talked to, distractable | Difficult to console

Each of the five categories (F) face, (L) leg, (A) activity, (C) cry and (C) consolability is scored from 0 – 2 resulting in total range of 0 – 10

### PAIN SCALE

**PAIN SCALE (FACE)\(^\text{a}\)**

![Pain Scale Face](image)

---

**PAIN SCALE (FACE)**

![Pain Scale Face](image)

*Adapted from IASP 2017*

---

**PAIN SCALE**

![Pain Scale](image)

*Adapted from IASP 2017*
### ANALGESIC MEDICATION TABLE

<table>
<thead>
<tr>
<th>Drug class</th>
<th>Drug</th>
<th>Recommended dosages</th>
<th>Side effects</th>
<th>Cautions and contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple analgesic</td>
<td>Paracetamol</td>
<td>Adults (oral or IV): 0.5 - 1 gm, 6 - 8-hourly Max: 4 gm/day</td>
<td>Rare</td>
<td>Hepatic impairment, alcohol dependence&lt;br&gt;PREFERRED drug particularly in elderly patients&lt;br&gt;Liver damage following over-dosage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child &gt;1 month old (oral or IV): (2) 20 mg/kg stat, then 15 mg/kg every 4 - 6-hourly Max: 60 mg/kg (up to 90 mg/kg for 48 hours)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selective Cox-2 Inhibitors</td>
<td>Celecoxib</td>
<td>Adults (oral): (1) 100 - 400 mg, 12 - 24-hourly Max: 800 mg/day</td>
<td>Renal impairment&lt;br&gt;ALLERGIC reaction in susceptible individuals&lt;br&gt;INCREASE in CVS events</td>
<td>Not recommended in severe renal and/or hepatic impairment (1)&lt;br&gt;Initiate therapy at lowest recommended dose in elderly (1)&lt;br&gt;Ischaemic heart disease&lt;br&gt;Cerebrovascular disease&lt;br&gt;Contraindicated in hypersensitivity to sulfonamides&lt;br&gt;Associated with a lower risk of serious upper gastrointestinal side effects compared to NSAIDs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*Child 2 years or older (oral): (1) (10 - 25 kg): 50 mg 12-hourly (&gt;25 kg): 100 mg 12-hourly or (2) 4 mg/kg daily</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Etoricoxib (3) Children and adults &gt;16 years old (oral): 60 - 90 mg daily 120 mg daily in acute pain Max: 90 mg/day, long-term use should be limited to a maximum of 90 mg daily 120 mg daily may be used for acute pain relief but for short-term only</td>
<td>Hypertension&lt;br&gt;Renal impairment&lt;br&gt;INCREASE in CVS events</td>
<td>Uncontrolled hypertension&lt;br&gt;Ischaemic heart disease&lt;br&gt;Cerebrovascular disease&lt;br&gt;Associated with a lower risk of serious upper gastrointestinal side effects compared to NSAIDs</td>
</tr>
<tr>
<td>Weak opioids</td>
<td>Tramadol</td>
<td>Adults (oral or IV): 50 - 100 mg, 6 - 8-hourly Max: 400 mg/day</td>
<td>Dizziness&lt;br&gt;Nausea&lt;br&gt;Vomiting&lt;br&gt;Constipation</td>
<td>Risk of seizures in patients with history of seizures with high doses&lt;br&gt;In elderly, start at lowest dose (50 mg) and maximum of 300 mg daily</td>
</tr>
<tr>
<td>Drug</td>
<td>Dosage and Administration</td>
<td>Side Effects</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------</td>
<td>--------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Child (oral or IV): (2)</td>
<td></td>
<td>Drowsiness</td>
<td>Interaction with TCA, SSRI and SNRI. (1): Safety and effectiveness not established in children &lt;12 years old; caution in children 12 - 18 years old who have risk factors that may increase respiratory depression</td>
<td></td>
</tr>
<tr>
<td>2 - 3 mg/kg stat, then 1 - 2 mg/kg every 4 - 6-hourly</td>
<td></td>
<td></td>
<td>(1): Safety and effectiveness not established in children &lt;12 years old; caution in children 12 - 18 years old who have risk factors that may increase respiratory depression</td>
<td></td>
</tr>
<tr>
<td>Dihydrocodeine tartrate (DF118)</td>
<td>Adults (oral): 30 - 60 mg, 6 - 8-hourly Max: 240 mg/day</td>
<td>Nausea</td>
<td>Respiratory depression Acute alcoholism Paralytic ileus Raised intracranial pressure</td>
<td></td>
</tr>
<tr>
<td>Child (oral): (2)</td>
<td></td>
<td>Vomiting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 - 1 mg/kg every 4 - 6-hourly</td>
<td></td>
<td>Constipation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combinations of paracetamol 500 mg + codeine 8 mg (Panadeine®)</td>
<td>Children and adults (oral): 1 - 2 tablets, 6 - 8-hourly Max: 8 tablets/day</td>
<td>Constipation</td>
<td>Reduce dose in elderly (1): Safety and effectiveness not established in children &lt;18 years old</td>
<td></td>
</tr>
<tr>
<td>Combinations of paracetamol 325 mg + tramadol 37.5 mg (Ultracet®)</td>
<td>Adults (oral): 1 - 2 tablets, 6 - 8-hourly Max: 8 tablets/day</td>
<td>Nausea</td>
<td>Hepatic impairment Renal impairment Alcohol dependence Epilepsy (1): Safety and efficacy is not established in children &lt;12 years old; caution in children 12 – 18 years old who have risk factors that may increase respiratory depression</td>
<td></td>
</tr>
<tr>
<td>Strong opioids</td>
<td></td>
<td>Vomiting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphine</td>
<td></td>
<td>Drowsiness</td>
<td>Acute bronchial asthma Respiratory depression Dose adjustment for renal impairment and head injuries Transdermal fentanyl - Not to be used unless opioid dose is stable Minimum dose: 12 µg/hr=30 mg oral morphine in 24 hours</td>
<td></td>
</tr>
<tr>
<td>Adults: (oral immediate-release): 5 - 10 mg every 4-hourly (elderly: 2.5 - 5 mg every 4 - 6-hourly) (oral sustained-release): To be given in 12-hourly dosing (SC/IM): (1): 5 - 20 mg every 4-hourly as needed (IV) (1): 2 - 10 mg every 4-hourly as needed</td>
<td>Common: Nausea Vomiting Constipation Drowsiness Sedation Not common in cancer pain: Sweating Euphoria Respiratory depression</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Child:**

(1) (oral immediate-release):
- 1 - 12 months old: 0.08 - 0.2 mg/kg every 4-hourly
- 1 - 2 years old: 0.2 - 0.4 mg/kg every 4-hourly
- 2 - 12 years old: 0.2 - 0.5 mg/kg every 4-hourly (max: 5 mg per dose)

(oral sustained-release):
- 1 - 12 years old: 0.2 - 0.8 mg/kg every 12-hourly

(SC/IV):
- Neonates: 25 - 50 µg/kg every 6-hourly
- 1 - 6 months old: 100 µg/kg every 6-hourly (max: 2.5 mg per dose)
- 6 months - 2 years old: 100 µg/kg every 4-hourly (max: 2.5 mg per dose)
- 2 - 12 years old: 100 - 200 µg/kg every 4-hourly (max: 2.5 mg per dose)

**Oxycodone**

Adults (oral):
- Immediate-release: 5 - 10 mg every 4 - 6-hourly
- Controlled-release: To be given in 12-hourly dosing

Children (oral): (2) 0.2 mg/kg every 4 - 6-hourly
- Controlled-release: 0.6 - 0.9 mg/kg every 12-hourly

**Oxycodone + Naloxone**

Children >12 years old and adults (oral):
- Oxycodone 10 mg/ naloxone 5 mg every 12-hourly titrated every 1 - 2 days (max: oxycodone 80 mg / naloxone 40 mg/ day)

**Pruritus**

- Not to be used in opioid naive patients

**Myoclonus**
<table>
<thead>
<tr>
<th>From</th>
<th>Codeine (mg/day)</th>
<th>Oral Morphine (mg/day)</th>
<th>SC Morphine (mg/day)</th>
<th>Oxycodone (mg/day)</th>
<th>Fentanyl transdermal patch (µg/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codeine (mg/day)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Morphine (mg/day)</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC Morphine (mg/day)</td>
<td>20</td>
<td>2.5</td>
<td></td>
<td>0.6</td>
<td>1.2</td>
</tr>
<tr>
<td>Oxycodone (mg/day)</td>
<td>12</td>
<td>1.5</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fentanyl transdermal patch</td>
<td>24</td>
<td>3</td>
<td>1.2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

*Celecoxib capsules can be opened and the contents emptied onto a teaspoon of applesauce or dispersed in water. One 200 mg of celebrex capsule is to be dispersed in 20 ml of water to yield a 10 mg/ml dispersion. Suspension should be freshly prepared, required volume immediately administered and balance discarded (internet communication, 9 September 2018 at [https://www.rch.org.au/uploadedFiles/Main/Content/pharmacy/Celecoxib.pdf](https://www.rch.org.au/uploadedFiles/Main/Content/pharmacy/Celecoxib.pdf))

Adapted:
2. Micromedex Version 1.80.0b2705
3. Frank Shann 17th Edition 2017
4. Package insert for etoricoxib
# HAEMOPHILIA JOINT HEALTH SCORE

**Assessment #:**

**Evaluator Name:**

**Subject ID #:**

**Date of Evaluation:**

## Hemophilia Joint Health Score Worksheet 2.1

<table>
<thead>
<tr>
<th></th>
<th>Left Elbow</th>
<th>Right Elbow</th>
<th>Left Knee</th>
<th>Right Knee</th>
<th>Left Ankle</th>
<th>Right Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Swell</strong> (N, P, S, T)</td>
<td>□ □ □ □</td>
<td>□ □ □ □</td>
<td>□ □ □ □</td>
<td>□ □ □ □</td>
<td>□ □ □ □</td>
<td>□ □ □ □</td>
</tr>
<tr>
<td><strong>Score</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments:**

- 0 = No swelling
- 1 = Mild: appears, feels slightly swollen; landmarks visible
- 2 = Moderate: looks swollen, feels spongy; some landmarks partly obscured
- 3 = Severe: looks very swollen; bony landmarks fully obscured

**Duration of Swelling**

- Note number of months

**Score**

- 0 = No swelling or < 6 months
- 1 = ≥ 6 months

---

*Page 1 of 5*
Hemophilia Joint Health Score Worksheet 2.1

Subject ID #: ____________________________ Date of Evaluation: ____________________________

Evaluator Name: ____________________________

Assessment #: ____________________________

<table>
<thead>
<tr>
<th>MUSCLE ATROPHY</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SCORE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = None - no atrophy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Mild - muscle has slightly less contour, or mild flattening of muscle belly is noted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Severe - moderate/severe muscle wasting and depression or flattening of the muscle belly is noted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
Please note decreased contour, muscle flattening, marked wasting.

<table>
<thead>
<tr>
<th>CREPITUS ON MOTION</th>
<th>Left Elbow</th>
<th>Right Elbow</th>
<th>Left Knee</th>
<th>Right Knee</th>
<th>Left Ankle</th>
<th>Right Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note:</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Audible (A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild (M)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palpable (P)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe (S)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If none apply: None (N)

<table>
<thead>
<tr>
<th>SCORE</th>
<th>Left Elbow</th>
<th>Right Elbow</th>
<th>Left Knee</th>
<th>Right Knee</th>
<th>Left Ankle</th>
<th>Right Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = No crepitus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Mild - slightly audible and/or palpable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Severe - Consistently moderately or very pronounced audible and/or palpable grinding and crunching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

page 2 of 5
### Hemophilia Joint Health Score Worksheet 2.1

**Assessment #:**  
**Evaluator Name:**

**Subject ID #:**  
**Date of Evaluation:** ___/___/___

#### FLEXION LOSS

<table>
<thead>
<tr>
<th></th>
<th>Left Elbow</th>
<th>Right Elbow</th>
<th>Left Knee</th>
<th>Right Knee</th>
<th>Left Ankle</th>
<th>Right Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flex:</td>
<td>Flex:</td>
<td>Flex:</td>
<td>Flex:</td>
<td>PlantarFlex:</td>
<td>PlantarFlex:</td>
</tr>
<tr>
<td></td>
<td>Measured in:</td>
<td>Measured in:</td>
<td>Measured in:</td>
<td>Measured in:</td>
<td>Measured in:</td>
<td>Measured in:</td>
</tr>
<tr>
<td></td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
</tr>
<tr>
<td></td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
</tr>
<tr>
<td></td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
</tr>
</tbody>
</table>

The recommendation is to score using both methods (normal contralateral side and normative tables) and then record the worse score.

#### SCORE

<table>
<thead>
<tr>
<th>Contra</th>
<th>0 = 5°</th>
<th>1 = Loss of 11° - 20°</th>
<th>2 = Loss of 21° - 30°</th>
<th>Normative</th>
<th>0 = Within Range</th>
<th>1 = Loss of 1° to 4°</th>
<th>2 = Loss of 5° - 10°</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### EXTENSION LOSS

<table>
<thead>
<tr>
<th></th>
<th>Left Elbow</th>
<th>Right Elbow</th>
<th>Left Knee</th>
<th>Right Knee</th>
<th>Left Ankle</th>
<th>Right Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ext:</td>
<td>Ext:</td>
<td>Ext:</td>
<td>Ext:</td>
<td>Dorsiflex:</td>
<td>Dorsiflex:</td>
</tr>
<tr>
<td></td>
<td>Measured in:</td>
<td>Measured in:</td>
<td>Measured in:</td>
<td>Measured in:</td>
<td>Measured in:</td>
<td>Measured in:</td>
</tr>
<tr>
<td></td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
</tr>
<tr>
<td></td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
</tr>
<tr>
<td></td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
<td>1) Supine</td>
<td>2) Sitting</td>
</tr>
</tbody>
</table>

The recommendation is to score using both methods (normal contralateral side and normative tables) and then record the worse score.

#### SCORE

<table>
<thead>
<tr>
<th>Contra</th>
<th>0 = 5°</th>
<th>1 = Loss of 11° - 20°</th>
<th>2 = Loss of 21° - 30°</th>
<th>Normative</th>
<th>0 = Within Range</th>
<th>1 = Loss of 1° to 4°</th>
<th>2 = Loss of 5° - 10°</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Hemophilia Joint Health Score Worksheet 2.1

<table>
<thead>
<tr>
<th>JOINT PAIN</th>
<th>Left Elbow</th>
<th>Right Elbow</th>
<th>Left Knee</th>
<th>Right Knee</th>
<th>Left Ankle</th>
<th>Right Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active joint move through range with gentle pressure (at end range)</td>
<td>Comments:</td>
<td>Comments:</td>
<td>Comments:</td>
<td>Comments:</td>
<td>Comments:</td>
<td>Comments:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SCORE</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

0 = No pain through active range of motion  
1 = No pain through active range, only pain on gentle overpressure or palpation  
2 = Pain through active range

### STRENGTH

<table>
<thead>
<tr>
<th>STRENGTH</th>
<th>Left Elbow</th>
<th>Right Elbow</th>
<th>Left Knee</th>
<th>Right Knee</th>
<th>Left Ankle</th>
<th>Right Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the Daniels &amp; Worthingham’s scale. Within available ROM, note grade</td>
<td>Flexion Extension</td>
<td>Flexion Extension</td>
<td>Flexion Extension</td>
<td>Flexion Extension</td>
<td>Flexion Extension</td>
<td>Flexion Extension</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SCORE</th>
<th># of heel raises</th>
<th># of heel raises</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plantar/Flex.</td>
<td>Plantar/Flex.</td>
</tr>
<tr>
<td></td>
<td>Dors/Flex.</td>
<td>Dors/Flex.</td>
</tr>
</tbody>
</table>

### Strength Scoring:

0 = Holds test position against gravity with maximum resistance (grad 5)  
1 = Holds test position against gravity with moderate resistance (but breaks with maximal resistance) (grad 4)  
2 = Holds test position against gravity with minimal resistance (grad 3), or holds test position against gravity (grad 2)  
3 = Able to partially complete ROM against gravity (grad 2+), or able to move through ROM gravity eliminated (grad 2), or through partial ROM gravity eliminated (grad 2-)  
4 = Trace (gr.1) or no muscle contraction (gr.0)  
NE = Non-evaluable

# of Heel Raises:  
Score 0 = 4 to 5 heel raises  
Score 1 = 2 to 3 heel raises  
Score 2 = Sufficiently plantar flexes to clear heel  
Score 3 = Plantar flexes ankle through range (gravity eliminated)  
Score 4 = Trace or no muscle contraction

Evaluator Name: ______________________  
Date of Evaluation: yyy/mm/dd
Hemophilia Joint Health Score Worksheet 2.1

Subject ID #: __________________________
Date of Evaluation: ____________ / ____________ / ____________

<table>
<thead>
<tr>
<th>GAIT (Skills)</th>
<th>Left Knee</th>
<th>Right Knee</th>
<th>Left Ankle</th>
<th>Right Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stairs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hopping on 1 leg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Individual joints to be observed but not scored

Note: N (normal), I (imp), TW (toe walking), WSF (walking on side of foot), US (uneven strides), NPO (no push off), AWS (abnormal weight shift), FTO (foot turned out), NHS (No heel strike), EHO (early heel off) OR DSP (decreased stance phase), LKE (Limited knee extension), KH (Knee hyperextension)

0 = All skills are within normal limits
1 = One skill is not within normal limits
2 = Two skills are not within normal limits
3 = Three skills are not within normal limits
4 = No skills are within normal limits
NE = Non-evaluable

Global Score: __________

* Axial alignment to be observed and not scored

<table>
<thead>
<tr>
<th>AXIAL ALIGNMENT</th>
<th>Left Knee</th>
<th>Right Knee</th>
<th>Left Ankle</th>
<th>Right Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td>To be measured in weight-bearing position</td>
<td>_____ degrees</td>
<td>_____ degrees</td>
<td>_____ degrees</td>
<td>_____ degrees</td>
</tr>
</tbody>
</table>

Please checkmark one:

- [ ] valgus
- [ ] varus

Please indicate the measured angle in the space provided

Page 5 of 5
Hemophilia Joint Health Score 2.1 - Summary Score Sheet

<table>
<thead>
<tr>
<th>Left Elbow</th>
<th>Right Elbow</th>
<th>Left Knee</th>
<th>Right Knee</th>
<th>Left Ankle</th>
<th>Right Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swelling</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Duration (swelling)</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Muscle Atrophy</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Crepits on motion</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Flexion Loss</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Extension Loss</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Joint Pain</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Strength</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Joint Total</th>
<th>NE = Non-Evaluable</th>
</tr>
</thead>
</table>

Sum of Joint Totals: ____________________________  NE = Non-Evaluable

Global Gait Score:

HJHS Total Score: ____________________________

Swelling
0 = No swelling
1 = Mild
2 = Moderate
3 = Severe

Crepitans on Motion
0 = None
1 = Mild
2 = Moderate
3 = Severe

Flexion Loss
0 = No swelling
or < 6 months
1 = > 6 months

Muscle Atrophy
0 = None
1 = Mild
2 = Severe

Extension Loss
0 = No swelling
1 = > 6 months

Joint Pain
0 = No pain through active range of motion
1 = No pain through active range; only pain on gentle overpressure or palpation
2 = Pain through active range

Strength (Using The Daniels & Worthingham’s scale)
0 = Holds test position against gravity with maximum resistance (g2+)
1 = Holds test position against gravity with moderate resistance (g4+)
2 = Holds test position with minimal resistance (g3+)
3 = Able to partially complete ROM against gravity (g2+)
4 = Trace (g1) or no muscle contraction (g0)

Global Gait (walking, stairs, running, hopping on 1 leg)
0 = All skills are within normal limits
1 = One skill is not within normal limits
2 = Two skills are not within normal limits
3 = Three skills are not within normal limits
4 = No skills are within normal limits

NOTE: There is an accompanying instruction manual and worksheets that are required when administering the HJHS

General Comments:

______________________________

______________________________

______________________________

______________________________

______________________________

______________________________

______________________________
# PETTERSON SCORE

<table>
<thead>
<tr>
<th>Radiologic Change</th>
<th>Finding</th>
<th>Score (Points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoporosis</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Present</td>
<td>1</td>
</tr>
<tr>
<td>Enlargement of epiphysis</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Present</td>
<td>1</td>
</tr>
<tr>
<td>Irregularity of subchondral surface</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Present</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pronounced</td>
<td>2</td>
</tr>
<tr>
<td>Narrowing of joint space</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>&lt;50%</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>&gt;50%</td>
<td>2</td>
</tr>
<tr>
<td>Subchondral cyst formation</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1 cyst</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>&gt;1 cyst</td>
<td>2</td>
</tr>
<tr>
<td>Erosions at joint margins</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Present</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pronounced</td>
<td>2</td>
</tr>
<tr>
<td>Incongruence between joint surfaces</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Slight</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pronounced</td>
<td>2</td>
</tr>
<tr>
<td>Deformity (angulation and/or displacement of articulating bones)</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Slight</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pronounced</td>
<td>2</td>
</tr>
</tbody>
</table>

Possible joint score: 0 - 13 points


Add up the score for each radiologic change to get the total score. The higher the total score, the worst is the arthropathy. There's no specified degree of score to say it's mild/moderate or severe.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>µg</td>
<td>microgramme</td>
</tr>
<tr>
<td>ABR</td>
<td>Annual Bleeding Rate</td>
</tr>
<tr>
<td>AGREE</td>
<td>Appraisal of Guidelines for Research and Evaluation</td>
</tr>
<tr>
<td>AH</td>
<td>Arnold-Hilgartner</td>
</tr>
<tr>
<td>AJBR</td>
<td>annual joint bleed rates</td>
</tr>
<tr>
<td>aPCC</td>
<td>activated prothrombin complex concentrate</td>
</tr>
<tr>
<td>APTT</td>
<td>Activated Partial Thromboplastin Time</td>
</tr>
<tr>
<td>BMI</td>
<td>body mass index</td>
</tr>
<tr>
<td>BU</td>
<td>Bethesda unit</td>
</tr>
<tr>
<td>CCC</td>
<td>Comprehensive Care Centre</td>
</tr>
<tr>
<td>CFC</td>
<td>clotting factor concentrate</td>
</tr>
<tr>
<td>CHMP</td>
<td>Committee for Medical Products for Human Use</td>
</tr>
<tr>
<td>COX-2</td>
<td>Cyclooxygenase-2</td>
</tr>
<tr>
<td>CPG(s)</td>
<td>clinical practice guidelines</td>
</tr>
<tr>
<td>CT</td>
<td>computer tomography</td>
</tr>
<tr>
<td>CV</td>
<td>cardiovascular</td>
</tr>
<tr>
<td>CVAD</td>
<td>central venous access device</td>
</tr>
<tr>
<td>DG</td>
<td>Development Group</td>
</tr>
<tr>
<td>DNA</td>
<td>deoxyribonucleic acid</td>
</tr>
<tr>
<td>DDVAP</td>
<td>desmopression</td>
</tr>
<tr>
<td>dL</td>
<td>desilitre</td>
</tr>
<tr>
<td>EDTA</td>
<td>ethylenediaminetetraacetic acid</td>
</tr>
<tr>
<td>EMA</td>
<td>European Medical Agency</td>
</tr>
<tr>
<td>FDA</td>
<td>Food Drug Agency</td>
</tr>
<tr>
<td>FISH</td>
<td>Functional Independence Score in Haemophilia</td>
</tr>
<tr>
<td>FIX</td>
<td>factor IX assay</td>
</tr>
<tr>
<td>FLACC</td>
<td>Face, Legs, Activity, Cry, Consolability</td>
</tr>
<tr>
<td>FVIII</td>
<td>factor VIII assay</td>
</tr>
<tr>
<td>g</td>
<td>gramme</td>
</tr>
<tr>
<td>GRADE</td>
<td>Grading Recommendations, Assessment, Development and Evaluation</td>
</tr>
<tr>
<td>Gy</td>
<td>Gray</td>
</tr>
<tr>
<td>HAV</td>
<td>hepatitis A virus</td>
</tr>
<tr>
<td>HCCC</td>
<td>Haemophilia Comprehensive Care Centre</td>
</tr>
<tr>
<td>HCV</td>
<td>hepatitis C virus</td>
</tr>
<tr>
<td>HIV</td>
<td>human immunodeficiency virus</td>
</tr>
<tr>
<td>HJHS</td>
<td>Haemophilia Joint Health Score</td>
</tr>
<tr>
<td>HMTAC</td>
<td>Haemophilia Medication Therapy Adherence Clinic</td>
</tr>
<tr>
<td>HTA</td>
<td>Health Technology Assessment</td>
</tr>
<tr>
<td>ICH</td>
<td>intracranial haemorrhage</td>
</tr>
<tr>
<td>IM</td>
<td>intramuscular</td>
</tr>
<tr>
<td>ITI</td>
<td>immune tolerance induction</td>
</tr>
<tr>
<td>IU</td>
<td>international unit</td>
</tr>
<tr>
<td>IU/kg</td>
<td>international unit/kilogram</td>
</tr>
<tr>
<td>IV</td>
<td>intravenous</td>
</tr>
<tr>
<td>kg</td>
<td>kilogramme</td>
</tr>
<tr>
<td>LA</td>
<td>local anaesthesia</td>
</tr>
<tr>
<td>MaHTAS</td>
<td>Malaysian Health Technology Assessment Section</td>
</tr>
<tr>
<td>mg</td>
<td>milligramme</td>
</tr>
</tbody>
</table>
ml | millilitre
MoH | Ministry of Health
MRI | magnetic resonance imaging
NSAID(s) | non-steroidal anti inflammatory drug(s)
OR | odds ratio
p | p value
PCC | prothrombin complex concentrate
PDF | plasma derived factor
PRICE | protection, rest, ice therapy, compression, elevation
PT | prothrombin time
PWH | person with haemophilia
QoL | quality of life
RC | Review Committee
RCT(s) | randomised controlled trial(s)
RD | risk difference
rFVIIa | recombinant FVIIa
ROM | range of motion/movement
RR | risk ratio
RS | radiosynovectomy
SC | subcutaneous
THR | total hip replacement
TKR | total knee replacement
TTP | time to progression
TXA | tranexamic acid
US | ultrasonography
VAS | Visual Analogue Score
VWD | von Willebrand Disease
vWF | von Willebrand Factor
vs | versus
WFH | World Federation of Haemophilia

**ACKNOWLEDGEMENT**

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- Technical Advisory Committee of CPG for their valuable input and feedback
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- All those who have contributed directly or indirectly to the development of the CPG

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The panel members of both DG and RC had completed disclosure forms. None held shares in pharmaceutical firms or acts as consultants to such firms. (Details are available upon request from the CPG Secretariat)

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