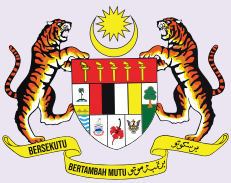
MINISTRY OF HEALTH MALAYSIA

ORTHOPAEDIC

STANDARD PRACTICE GUIDELINES FOR ASSISTANT MEDICAL OFFICERS IN ORTHOPAEDIC

CAWANGAN PERKHIDMATAN
PENOLONG PEGAWAI PERUBATAN



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FOREWARD Message

Director General of Health Malaysia

Standard Practice Guidelines (SPG) for Assistant Medical Officer (AMOs) in Orthopaedic serves as a guide to meet the standards of care and professionalism set out by the Ministry of Health of Malaysia (MOH). Therefore, in 2006 the produced its first Edition Standard Operating Procedure for Assistant Medical Officers in Orthopaedic to ensure good quality for orthopaedic patients. It also serves to enhance public awareness of standards expected from AMOs who provide specialized care for patients. Public awareness of standards expected from AMOs will hopefully encourage greater compliance amongst AMOs themselves to these guidelines. It is in their best interest to adhere, at all times, to the SPG laid in this book.

Of late, AMOs have seen many positive changes initiated by Assistant Medical Officer Services Section with full support from Medical Practice Division and from all Orthopaedic Consultants in MOH. The MOH recognizes the valuable contributions by AMOs and have created several senior posts to enhance and improve the clinical supervision and management of patients.

The Ministry of Health has always stressed on the importance of effective supervision of their peers by senior AMOs, under the guidance of Medical Officer and Specialist. The preparation of the SPF of AMOs in Orthopaaedic are aimed at providing usefull information for quality patient care and I hope these guidelines will be use as reference material for all orthopaedic AMOs throughout the country in the execution of their duties and efforts to provide quality Orthopaedic Services.

On behalf of the MOH, I would like to extend my distinguished congratulations to the Assistant Medical Officer Services Section, Medical Practice Division as well as the Assistant Medical Officer Technical Revision Committee for their tireless efforts and commitment to publish the Standard Practice Guidelines Orthopaedic for AMOs. My personal heart-warming appreciation tributes to AMOs throughout the country who uphold highest standard of professionalism in the execution of their duties in order to provide quality health care to the community. I am always impressed with efforts to strive for excellence in service delivery and such effort by the AMOs are most commendable indeed.

Thank you.

DATUK DR. MUHAMMAD RADZI BIN ABU HASSAN

FOREWARD Message

Director Medical Practice Division
Ministry of Health, Malaysia

I would like to thank, those who have contributed to this document especially the Assistant Medical Officer Technical Revision Committee Orthopaedics Procedures for Assistant Medical Officers (AMOs), Assistant Medical Officer Services Section, KKM and Orthopaedic Specialists who have worked alongside with the drafting team and as reviewers in making this Standard Practice Guidelines (SPG) for AMOs in Orthopaedic.

There is an ever-increasing complexity in Orthopaedic surgical procedures. This reference compilation will be a guide to AMOs and also ensure greater uniformity in the practice. Not only will it enhance quality of care and safety, it will also minimize errors and morbidities in patient care.

The meticulous and great effort invested in this publication is reflected in its systematic, simple and clear manner for easy reading and reference. Hence,I am confident that this book will be a useful guide in AMOs daily practice. This SPG containing 25 chapters is very important as a revision of the first Edition which documented 11 Standard Operating Procedures in order to accommodate development of new subspecialty and technology in orthopeadics procedures.

My sincere thanks to the Assistant Medical Officer Services Section, Medical Practice Division, Ministry of Health for their support and to all those involved in the publication of this guidelines including those whose names are not mentioned unintentionally.

Thank you.

DR. MOHAMED IQBAL BIN HAMZAH

FOREWARD Message

Head Of National Orthopaedic Services
Ministry of Health, Malaysia

It is my great pleasure and honour to say a few words on this Standard Practice Guidelines (SPG) for Assistant Medical Officer (AMOs) in Orthopaedic. I would like to congratulate this working committee in the preparation and compilation of this clinical guidelines.

These clinical guidelines procedures have existed since the beginning of orthopaedic services in this country. This compilation reflects the proactive stance of members, in their desire to put practice in writing. The listed procedures are not exhaustive, but comprehensive and practical in this general application.

There is an ever-increasing complexity in orthopaedic surgical procedures. This reference complilation will be guide to AMOs, and also ensure greater uniformity in the practice. Not only will it enhance quality care and safety.

The meticulous and great effort invested in this publication is reflected in this systematic, simple and clear manner for easy reading and reference. Hence, I am confident that this SPG for AMOs in Orthopaedic will be a useful as a reference.

I would like to express my gratitude to the Assistant Medical Officer Technical Revision Committee, specialist and medical officer for coming forward in sharing their experience and knowledge in this clinical guidelines. My sincere thanks to the Assistant Medical Officer Services Section, Medical Practice Division, Ministry of Health for their support and to all those involved in the publication of this guidelines including those whose names are not mentioned unintentionally.

Thank you.

DR. ABDUL MUTTALIB BIN ABDUL WAHID

FOREWARD *Message*

Head Of Assistant Medical Officer Malaysia
Assistant Medical Officer Services Section
Ministry of Health, Malaysia

In the Ministry of Health, several generations of Assistant Medical Officers (AMOs) have all practiced the long-standing tradition of on the job training to ensure everyone has access to the most up to date information and skills. The Standard Practice Guidelines (SPG) for AMOs in Orthopaedic is a written description of a specific procedure. It is critical, particularly in the orthopaedic services, to ensure that quality and consistency are maintained at all times.

While implementing the skill they learned during training was never an issue, some people have expressed fear and concern over the lack of papers that outline conventional techniques for carrying out specific activities. As a result, the release of this SPG for orthopaedic will aid AMOs who serve in this field even more effectively.

This brand-new iteration of the SPG for orthopaedic will be more applicable at this moment due to rapid changes in the medical sector, specifically in orthopaedics field. This SPG will assure performance consistency, precision, and also productivity in carrying out the task.

Drafting the SPG was not an easy job as it should considered everything in all aspect and I would like to take this opportunity to congratulate all of our contributors for their oustanding effort in completion this new iteration of the SPG for AMOs in orthopaedic. We owe the writers of this SPG lines our gratitude for their time, effort, and perseverance.

Thank you.

EN. ZULHELMI BIN ABDULLAH

COMMITEE MEMBERS

ADVISOR:

DR. ABDUL MUTTALIB BIN ABDUL WAHID
Head of Specialty for Orthopaedic Services
Senior Consultant Orthopaedic
Hospital Tuanku Jaafar, Seremban

DR. SAADON BIN IBRAHIM
Senior Consultant Orthopaedic
Hospital Sultan Ismail, Johor Bahru

DR. COLIN KOMAHEN KAMALANATHAN
Orthopaedic Surgeon
Hospital Tengku Ampuan Afzan, Kuantan

EN. ZULHELMI BIN ABDULLAH
Head Assistant Medical Officer Malaysia
Assistant Medical Officer Services Section
Ministry of Health, Malaysia

COORDINATOR:

EN. ALIAS BIN ABU HASSAN
Head of Policy and Strategic Planning Sector
Assistant Medical Officer Services Section
Ministry of Health, Malaysia

EN. SHAIFUL BAHARI BIN MOHAMMAD SHAH
Assistant Medical Officer
Assistant Medical Officer Services Section
Ministry of Health, Malaysia

YM. ENGKU MOHD NAZRI ENGKU MANSOR
Assistant Medical Officer
Assistant Medical Officer Services Section
Ministry of Health, Malaysia

COMMITTEE MEMBERS :

TN. HJ. MAHADIR BIN YUNUS
Deputy Chief Assistant Medical Officer Assistant Malaysia
Assistant Medical Officer Services Section
Ministry of Health, Malaysia

EN. WAN ASRULNIZAN BIN WAN MUSTAFFA
Chief Secretariat Medical Assistant Board
Assistant Medical Officer Services Section
Ministry of Health, Malaysia

TN. HJ. MOHD JOHARI BIN YUSOF
State Deputy Chief of Assistant Medical Officer (Medical)
Jabatan Kesihatan Negeri Terengganu

TN. HJ. NAZURUDDIN BIN MOHD ARIFF
Assistant Medical Officer
Hospital Kuala Lumpur

EN. GAYBREL A/L PETER
Assistant Medical Officer
Hospital Tuanku Ja'afar, Seremban, Negeri Sembilan

EN. MOHD NADZRI BIN OMAR
Assistant Medical Officer
Hospital Ampang, Selangor

TN. HJ. ZULKEFLI BIN BABA
Assistant Medical Officer
Hospital Melaka, Melaka

TN. HJ. AHMAD SUKERI BIN AZMI
Assistant Medical Officer
Hospital Pulau Pinang, Pulau Pinang

TN. HJ. MOHD BAKRI BIN HASBULLAH
Assistant Medical Officer
Hospita Raja Perempuan Zainab II, Kota Bharu, Kelantan

EN. NORDIN BIN KAMIS
Assistant Medical Officer
Hospital Sultanah Bahiyah, Alor Setar, Kedah

EN. NAZARUDDIN BIN MAT ARSHAD
Assistant Medical Officer
Hospital Sungai Buloh, Selangor

EN. RAZIEEYLLAH BIN RAMLI
Assistant Medical Officer
Hospital Kajang, Selangor

TN. HJ. FAZIL BIN AWANG
Assistant Medical Officer Hospital
Tuanku Fauziah, Kangar, Perlis

EN. RAJA A/L PERAMAL
Assistant Medical Officer
Sultanah Aminah Hospital, Johor Bharu, Johor

EN. MOHAMAD SAMSUL BIN AHMAD
Assistant Medical Officer
Hospital Tengku Ampuan Rahimah, Klang, Selangor

EN. MIKIM RADEM
Assistant Medical Officer
Hospital Umum Sarawak, Kuching, Sarawak

EN. MHD HASNAN BIN MOHAMMED
Assistant Medical Officer
Jabaatan Kesihatan Negeri Kedah

EN. MOHD JILANI BIN NORDIN
Assistant Medical Officer
Hospital Sultan Haji Ahmad Shah, Temerloh, Pahang

TN. HJ. NIK HAZRI BIN NIK DIN
Assistant Medical Officer
Hospital Kuala Lumpur

EN. MOHD NAJIB BIN OSMAN
Assistant Medical Officer
Hospital Kuala Lumpur

EN. MOHAMAD HAFIZ BIN ABDOL RANI
Assistant Medical Officer
Hospital Kuala Lumpur

EN. MOHD FAUROZEE BIN ISMAIL@ABD RASHID
Assistant Medical Officer
Hospital Kuala Lumpur

EN. MOHAMAD RIDUAN BIN MAT NASIR
Assistant Medical Officer
Hospital Sultan Ismail Petra, Kuala Krai, Kelantan

TN. HJ. AHMAD FAIZUN BIN YUNUS @ AZIZ
Assistant Medical Officer
Pejabat Kesihatan Raub, Raub, Pahang

LIST OF CONTRIBUTORS

DATO DR. MUHAMMAD ANWAR HAU BIN ABDULLAH
Senior Consultant Orthopaedic
Hospital Raja Perempuan Zainab II, Kota Bahru, Kelantan

DATO' DR. HJ. FAZIR BIN MOHAMAD
Senior Consultant Orthopaedic
Hospital Kuala Lumpur

DATO' DR. RASHDEEN FAWZI BIN MUHAMMAD NAWAWI
Senior Consultant Orthopaedic
Hospital Selayang, Selangor

DATUK DR. SIVAPATHASUNDARAM
Senior Consultant Orthopaedic
Hospital Melaka, Melaka

TO' PUAN DR. HJH. ATIKAH AMIRAH @ SUZANNA BINTI ABDULLAH
Senior Consultant Orthopaedic
Hospital Sultanah Nur Zahirah, Kuala Terengganu, Terengganu

DR. FELIX LOONG YEW SENG
Senior Consultant Orthopaedic
Hospital Ampang, Selangor

DR. LYNN AZURA BINTI MD SHAM
Orthopaedic Surgeon
Hospital Ampang, Selangor

DR. HISHAMUDDIN BIN SALAM
Senior Consultant Orthopaedic
Hospital Sultanah Aminah, Johor Bahru, Johor

DR. SITI HAWA BINTI TAHIR
Senior Consultant Orthopaedic
Hospital Kuala Lumpur

DR. SURYASMI BINTI DUSKI
Senior Consultant Orthopaedic
Hospital Kuala Lumpur

DR. ARSHAD BIN PUJI
Senior Sport Physician
Hospital Kuala Lumpur

DR. DZULKARNAIN BIN AMIR
Senior Consultant Orthopaedic
Hospital Kuala Lumpur

DR. KUNALAN A/L GANTHEL
Senior Consultant Orthopaedic
Hospital Kuala Lumpur

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- The Director General of Health, Malaysia
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- The Director of Medical Practice Division, Ministry of Health
- The Technical Advisor of Clinical Guidelines
- The Members of Technical Committee
- The Panel of Reviewers
- The Panel of Contributors
- Secretary Training Division, Ministry of Health
- Assistant Medical Officer Services Section, Ministry of Health
- The Principals of Medical Assistants Colleges
- All State Health Department
- All Hospital, Ministry of Health
- All other individuals and organisation who have contributed directly or indirectly towards the success of this publication

TABLE OF Contents

Orthopaedic Procedure - (General / Sub Speciality - Spine, Sport, Arthroplasty, Oncology, Foot & Ankle, Paediatric, Hand & Micro)

LIST OF ABBREVIATION

ACJ	Acromioclavicular Joints
ACL	Anterior Cruciate Ligament
ADL	Activities of Daily Living
AMO	Assistant Medical Officer
AMOs	Assistant Medical Officers
AP	Anterior Posterior
ASIS	Anterior Superior Iliac Spine
BBF	Bohler Braun Frame
CMR	Closed Manipulation and Reduction
CPM	Continues Passive Motion
CRT	Capillary Refill Rate
CTEV	Congenital Talipes Equinovarus
DIP	Distal Interphalangeal
DIPJ	Distal Interphalangeal Joints
ETT	Endotracheal Tube
IPJ	Interphalanges Joint
KKM	Kementerian Kesihatan Malaysia
LPP	Lembaga Pembantu Perubatan
MCP	Metacarpophalangeal
MCPJ	Metacarpophalangeal Joints
MOH	Ministry of Health
MRI	Magnetic Resonance Imaging
MTPJ	Metatarsophalangeal Joints
PCL	Posterior Cruciate Ligament
PIP	Proximal Interphalangeal
PIPJ	Proximal Interphalanges Joint
POP	Plaster of Paris
PTB	Patella Tendon Bearing
PTS	Posterior Tibial Support
SOP	Standard of Procedure
SPG	Standard Practice Guideline
THR	Total Hip Replacement
TKR	Total Knee Replacement
TLSO	Thoracolumbar Sacral Orthosis

CHAPTER 1 : CLOSED MANIPULATION AND REDUCTION (CMR)

1.1 Closed Manipulation and Reduction (CMR) of Close Fractures

1.1.1 Upper Limb

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b. Close Facture of Radius/Ulna (Midshaft)

c. Close Facture of Radius/Ulna (Distal end)

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II. Smith's Fracture

III. Barton Fracture

d. Close Fracture of Scaphoid

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a. Close Fracture Femur (Paediatric)

b. Close Fracture Tibia/Fibula

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1.2 Close Manipulation and Reduction (CMR) Of Joint Dislocation

1.2.1 Upper Limb

a. Shoulder Joint Dislocation

b. Elbow Joint Dislocation

1.2.2 Lower Limb

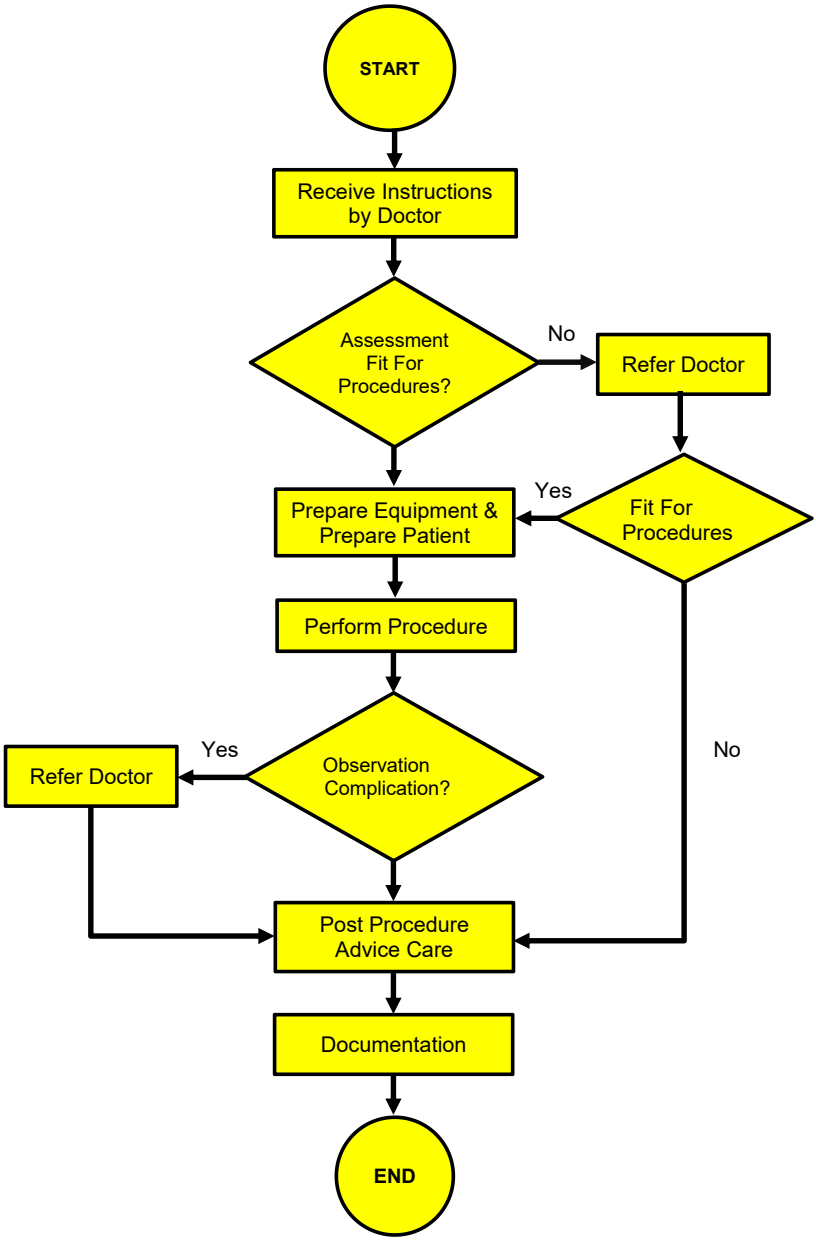
a. Hip Joint Dislocation

b. Knee Joint Dislocation

c. Ankle Joint Dislocation

***All Procedure in This Chapter Need More Than 1 Healthcare Provider to Perform**

CHAPTER 1: FLOWCHART CLOSED MANIPULATION AND REDUCTION (CMR)



CHAPTER 1
WORK PROCESS: CLOSED MANIPULATION AND REDUCTION (CMR)

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications.		
Indication	1. Fracture and joint dislocation 2. Displaced fracture 3. Angulated fracture 4. Subluxation/dislocation		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor	1. Read the instructions 2. Verify consent	1. KKM Consent Form:PER/CONSENT/2016	1. Patient record system 2. Order slip 3. Consent form
2. Assessment / Examination	1. Review the X-ray 2. Confirm the fracture site 3. Assess the deformity of the limb 4. Check the condition of any wound 5. Assess pulse, Capillary Refill Time (CRT), limb movement, and pain score 6. Remove any accessories if present 7. Refer doctor if any abnormalities found and patient might benot fit for the procedure	2. Pain as the 5th Vital Sign Guidelines Third Edition 2018	1. X-ray - AP view - Lateral view 2. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO.01/17 3. Arm sling
3. Prepare equipment and prepare patient	1. Ensure the POP Trolley is fully equipped and functional 2. Correct patient 3. Order slip		

	4. Confirm with the patient the affected limb 5. Position the patient comfortably 6. Place a linen protector under the injured limb,if necessary		1. POP Trolley **Refer Appendix 1** 2. Personal Protection Equipment 3. Linen Protector 4. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO.01/17
5. Perform procedure	1. Assist in sedation or digital block as directed by the doctor 2. Wait until the patient is fully sedated 3. Perform wound dressing if necessary 4. With the help of the second assistant, carefully hold the affected limb and provide counter traction using the traction/counter traction technique 5. To perform the reduction and manipulation of fracture/dislocation **Refer work process** 1.1.1 CMR of closed fracture 1.1.2 CMR of dislocation 6. Assistant Medical Officer apply POP/Splint /Slab/Strapping according to the type of fracture:	CMR technique 1. Closed reduction principles.	1. Personal Protection Equipment 2. X-ray film (pre & post reduction) - AP view - Lateral view 3. Sedation Score

	Refer work process **Chapter 2** Application of Plaster Cast/Plaster Slab **Chapter 5** Application of Splint **Chapter 6** Application of Bandaging & Strapping 7. Clean the affected limb * Mark window if necessary		
5. Observation	1. Check pulse, Capillary Refill Time (CRT) and movement of the limb 2. Pain score 3. Inform the doctor if any complication arises 4. Observe circulation and sensation until patient discharge	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018	1. Pain score scale 2. Circulation chart 3. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO.01/17
6. Post procedure advice care	1. Wound care 2. Encourage movement of extremities 3. Care of splint Advise patient to come to Orthopaedic Outpatient Clinic/Emergency Department immediately if any of the condition below develop: 3.1 Swelling 3.2 Severe pain	1. Provide the patient with an advice slip	1. Health Education: LPP.ORTHO.02/17 (Orthopedic Advice Slip)

	3.3 Numbness 3.4 Monitor for any change in color of extremities 3.5 Fever 3.6 Foul smell		
7. Documentation	1. Document the procedure		a) Procedure record system
8. Reference	1. Panduan Praktikal Pemasangan Plaster Kast (KKM) Edisi ke 2(2012) 2. *Pain The 5th Vital Sign third Edition* (2018) 3. *Policies & Procedures on Infection Prevention and Control* (KKM) (2019) 4. *AO Trauma Casts, Splints, And Support Bandages – Non Operative Treatment and Periopertive Protection* 5. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006)		

PERFORM PROCEDURE :

1.1 : CLOSED MANIPULATION AND REDUCTION (CMR) FRACTURE

1.1.1 : UPPER LIMB

a) Closed Fracture Humerus

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	1. Minimally displace fracture 2. Proximal fracture 3. Mid shaft fracture 4. Supracondylar fracture (Paediatric)
Activity	**Work Process**
Perform procedure	1. Various techniques can be employed however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant holds the affected limb carefully and applies pull/traction 3. With the help of the second assistant, hold the affected limb carefully and provide counter traction 4. The third assistant performs reduction through inline traction and realignment 5. Apply plaster cast (refer chapter 2.1.1 / 2.1.2 / 2.1.7 / 6.3)
Reference	1. https:// www.orthobullets.com/trauma/1016/humeral-shaft-fracturest 2. https://www.rch.org.au/clinicalguide/guideline_index/fractures/humeral_shaft_fractures_emergency_department/ 3. Kumar V, Singh A. Fracture supracondylar humerus: A review. Journal of clinical and diagnostic research: JCDR. 2016 Dec;10(12):RE01 4. Zhang XN, Yang JP, Wang Z, Qi Y, Meng XH. A systematic review and meta-analysis of two different managements for supracondylar humeral fractures in children. Journal of orthopaedic surgery and research. 2018 Dec 1;13(1):141. 5. Vaquero-Picado A, González-Morán G, Moraleda L. Management of supracondylar fractures of the humerus in children. EFORT open reviews. 2018 Oct;3(10):526-540. 6. Alton TB, Werner SE, Gee AO. Classifications in brief: the Gartland classification of supracondylar humerus fractures. 2015 Feb ;472(2):738-731

b) Closed Fracture Radius Ulna (Midshaft)

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	1. Simple fracture of midshaft 2. Green stick fracture
Activity	**Work Process**
Perform Procedure	1. Various techniques can be employed however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant perform reduction through inline traction and pressure on the fracture fragment 5. Apply plaster cast (refer chapter 2.1.2)
Reference	1. Vopat, Matthew L et al. "Treatment of diaphyseal forearm fractures in children." Orthopedic reviews vol. 6,2 5325. 24 Jun. 2014, doi:10.4081/or.2014.5325 2. Orthobullets Both Bone Forearm Fracture – Pediatric https://www.orthobullets.com/pediatrics/4126/both-boneforearm-fracture–pediatric 3. Schweich P. Midshaft forearm fractures in children. Post TW (Ed). UpToDate, Waltham, MA. 2019 4. Price CT. Acceptable alignment of forearm fractures in children: Open reduction indications. J Pediat Ortho 2010; 30: S82-4. 5. Schulte L, Meals C, Neviaser R. Management of Adult Diaphyseal Both-Bone Forearm Fractures. J Am Acad Orthop Surg. 2014;22(7):437-46. doi:10.5435/JAAOS-22-07-437 - Pubmed 6. Zhao L, Wang B, Bai X, Liu Z, Gao H, Li Y. Plate Fixation Versus Intramedullary Nailing for Both-Bone Forearm Fractures: A Meta-Analysis of Randomized Controlled Trials and Cohort Studies. World J Surg. 2017;41(3):722-33. doi:10.1007/s00268-016-37531 - Pubmed 7. dos Reis F, Faloppa F, Fernandes H, Albertoni W, Stahel P. Outcome of Diaphyseal Forearm Fracture-Nonunions Treated by Autologous Bone Grafting and Compression Plating. Ann Surg Innov Res. 2009;3(1):5. doi:10.1186/1750-1164-3-5 - Pubmed

c) Closed Fracture of Radius/Ulna (Distal Radius Fracture)

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	1. Extra-articular fracture of the distal radius 2. Radial shortening < 5mm 3. Dorsal angulation < 5° or within 20° of contralateral distal radius
Activity	**Work Process**
Perform procedure	1. Various techniques can be employed; however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant performs reduction by longitudinal traction and applies volar/dorsal pressure to the distal fracture fragment 5. Avoid positions of extreme flexion and ulna deviation (Cotton-Loder Position) due to the risk of Carpal Tunnel Syndrome 6. Apply plaster cast (refer chapter 2.1.2 / 2.1.3)
Reference	1. MacDermid JC, Roth JH, Richards RS. Pain and disability reported in the year following a distal radius fracture: a cohort study. BMC Musculoskeletal Disord. 2003;4:24. 2. Wright TW, Horodyski M, Smith DW. Functional outcome of unstable distal radius fractures: ORIF with a volar fixed-angle tine plate versus external fixation. J Hand Surg Am. 2005;30(2):289-299. 3. Arora R, Gabl M, Gschwentner M, Deml C, Krappinger D, Lutz M. A comparative study of clinical and radiologic outcomes of unstable colles type distal radius fractures in patients older than 70 years: nonoperative treatment versus volar locking plating. J Orthop Trauma. 2009;23(4):237-242. 4. Michlovitz SL, Lastayo PC, Alzner S, Watson E. Distal radius fractures: therapy practice patterns. Journal of hand therapy. 1;14(4):249-57. 5. Distal **Radius Fractures** (Broken Wrist) (American Academy of Orthopaedic Surgeons) Wrist Injuries and Disorders/Specifics ... Wrist Injuries and Disorders...Arm Injuries and Disorders/Specifics... Arm Injuries and Disorders...American Academy of Orthopaedic...https://orthoinfo.aaos.org/.../distal-radius-fractures-broken-wrist

i) Colle's Fracture

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	1. Extra-articular fracture of the distal radius with dorsal angulation and dorsal displacement, occurring within 2cm of the articular surface 2. A distal radius fracture results in posterior displacement of the distal fragment, leading to the forearm being angled posteriorly just proximal to the wrist
Activity	**Work Process**
Perform Procedure	1. Various techniques can be employed; however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant perform reduction through inline traction and applies dorsal pressure to the distal fracture fragment 5. A three-pointed molded plaster is applied (refer chapter 2.1.3 / 2.1.9)
Reference	1. Stephen Balsky, Rehabilitation protocol for undisplaced Colles' fractures following cast removal, the journal of the Canadian chiropractic association.(Level of evidence 4) 2. Joseph TN. Medline Plus. Colles' Wrist Fracture. http://www.nlm.nih.gov/medlineplus/ency/article/000002.htm (Accessed 2 July 2009). 3. https://www.kenhub.com/en/library/anatomy/colles-fracture https://commons.wikimedia.org/wiki/File%3ACollesfracture.jpg 4. Balsky S, Goldford RJ. Rehabilitation protocol for undisplaced Colles' fractures following cast removal. The Journal of the Canadian Chiropractic Association. 2000 Mar;44(1):29. 5. Pho C, Godges J. Colles' fracture. KPSoCal Ortho PT Residency Web site.http://scal-assets.s3.amazonaws.com/scal-ptresidencyfellowship/ 04WristandHand%20Region/20WristCollesFracture.pdf

ii) Smith's Fracture

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	Volar angulation of the distal fragment of an extraarticular fracture of the distal radius (the reverse of Colles fracture), with or without volar displacement
Activity	**Work Process**
Perform Procedure	1. Various techniques can be employed; however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant performs reduction using inline traction and applies anterior/volar pressure to the distal fracture fragment 5. Applying a long arm cast with the forearm in supination and wrist in neutral or a degree of extension. (refer chapter 2.1.2)
Reference	1. Schroeder JD, Varacallo M. Smith's Fracture Review.InStatPearls [Internet] 2019 Oct 1. StatPearls Publishing 2. Matsuura Y, Rokkaku T, Kuniyoshi K, Takahashi K, Suzuki T, Kanazuka A, Akasaka T, Hirosawa N, Iwase M, Yamazaki A, Orita S. Smith's fracture generally occurs after falling on the palm of the hand. Journal of Orthopaedic Research. 2017 Nov;35(11):243541. 3. Andrew Murphy. Assoc Prof Frank Gaillard et al.Smith fracture. Radiopedia.accessed on 4/10/20https://radiopaedia.org/articles/smith-fracture 4. Emergency Care South Wales Smiths.Accessed from https://www.aci.health.nsw.gov.au/networks/eci/clinical/clinical-resources/clinical-tools/orthopaedic-andmusculoskeletal/musculoskeletal-orthopaedic-guide/smiths#:~:text=Most%20commonly%20an%20extra%2Darticular,falling%20on%20a%flexed%20wrist.on 28/10/20 5. Glickel SZ, Catalano LW, Raia FJ, Barron OA, Grabow R, Chia B. Long-term outcomes of closed reduction and percutaneous pinning for the treatment of distal radius fractures. The Journal of hand surgery. 2008 Dec 1;33(10):1700-5

iii) Barton's Fracture

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	An intra-articular fracture of the distal radius with associated dislocation of the radio-carpal joint
Activity	**Work Process**
Perform procedure	1. Various techniques can be employed; however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. A three-pointed molded plaster is applied. (refer chapter 2.1.3 / 2.1.9/ 2.1.10)
Reference	1. Wrist Fractures: What the Clinician Wants to Know by Charles A. Goldfarb, MD, Yuming Yin, MD, Louis A. Gilula, MD, Andrew J. Fisher, MD and Martin I. Boyer, MDRadiology. 2001;219:11-28. 2. Treatment of Unstable Distal Radial Fractures with the Volar Locking Plating System by Kevin C. Chung et al The Journal of Bone and Joint Surgery (American). 2006;88:2687-2694. 3. Palmar Tilt of the Distal Radius: Influence of Off-lateral Projection Initial Observations by Marco Zanetti, MD, Louis A. Gilula, MD, Hilaire A. C. Jacob, PhD and Juerg Hodler, MDRadiology. 2001;220:594-600 4. Unstable extra-articular fractures of the distal radius A PROSPECTIVE, RANDOMISED STUDY OF IMMOBILISATION IN A CAST VERSUS SUPPLEMENTARY PERCUTANEOUS PINNING by T. Azzopardi et al. J Bone Joint Surg Br 2005; 87-B: 837840 5. Indications for Reduction in Distal Radius Fractures by David L Nelson, MD of the International distal radius fracture study group 6. Di Matteo B, Tarabella V, Filardo G, Viganò A, Tomba P, Marcacci M. John Rhea Barton: the birth of osteotomy. (2013) Knee surgery, sports traumatology, arthroscopy : official journal of the ESSKA. 21 (9): 1957-62. doi:10.1007/s00167-013-2387-1 - Pubmed 7. Hunter TB, Peltier LF, Lund PJ. Radiologic history exhibit. Musculoskeletal eponyms: who are those guys?. Radiographics. 2000;20 (3): 819-36. Radiographics (full text) - Pubmed citation

d) Closed Fracture of Scaphoid

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complication
Indication	Scaphoid - dinner folk deformity
Activity	**Work Process**
Perform procedure	1. Various techniques can be employed; however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant performs reduction through inline traction and realigns the distal fragment with palmar flexion and ulnar deviation 5. Apply Plaster cast is performed by distal fragment in palmar flexion and ulnar deviation (refer chapter 2.1.4)
Reference	1. Scaphoid Fracture of the Wrist (American Academy of Orthopaedic Surgeons) 2. Wrist Injuries and Disorders/Specifics ... Wrist Injuries and Disorders ... American Academy of Orthopaedic Surgeons ... A scaphoid fracture is a break in one of the... https://orthoinfo.aaos.org/.../scaphoid-fracture-of-the-wrist – 3. Jesse M. Pines, Worth W. Everett. Evidence-Based Emergency Care. (2011) ISBN: 9781444357172 - Google Books 4. Berná J, Chavarria G, Albaladejo F et al. Panoramic Versus Conventional Radiography of Scaphoid Fractures. AJR Am J Roentgenol. 2004;182(1):155-9. doi:10.2214/ajr. 182.1.1820155 - Pubmed 5. Hunter J, Escobedo E, Wilson A, Hanel D, Zink-Brody G, Mann F. MR Imaging of Clinically Suspected Scaphoid Fractures. AJR Am J Roentgenol. 1997;168(5):1287-93. doi:10.2214/ajr. 168.5.9129428 - Pubmed 6. Khalid M, Jummani Z, Kanagaraj K, Hussain A, Robinson D, WalkerR. Role of MRI in the Diagnosis of Clinically Suspected Scaphoid Fracture: Analysis of 611 Consecutive Cases and Literature Review. Emerg Med J. 2010;27(4):266-doi:10.1136/emj. 2008.058750 - Pubmed 7. Memarsadeghi M, Breitenseher M, Schaefer-Prokop C et al. Occult Scaphoid Fractures: Comparison of Multidetector CT and MR

Imaging--Initial Experience. Radiology. 2006;240(1):169-76. doi:10.1148/radiol.2401050412 - Pubmed

8. Brydie A & Raby N. Early MRI in the Management of Clinical Scaphoid Fracture. Br J Radiol. 2003;76(905):296-300. doi:10.1259/bjr/19790905 - Pubmed
9. Goldfarb C, Yin Y, Gilula L, Fisher A, Boyer M. Wrist Fractures: What the Clinician Wants to Know. Radiology. 2001;219(1):11-28. doi:10.1148/radiology.219.1.r01ap1311 - Pubmed
10. Philip Robinson. Essential Radiology for Sports Medicine. (2010) ISBN: 9781441959720 - Google Books
11. Scaphoid Fracture of the Wrist (American Academy of Orthopaedic Surgeons)
12. Wrist Injuries and Disorders/Specifics ... Wrist Injuries and Disorders ... American Academy of Orthopaedic Surgeons ... A scaphoid fracture is a break in one of the...https://orthoinfo.aaos.org/... /scaphoid-fracture-of-the-wrist
13. Jesse M. Pines, Worth W. Everett. Evidence-Based Emergency Care. (2011) ISBN: 9781444357172 - Google Books
14. Berná J, Chavarria G, Albaladejo F et al. Panoramic Versus Conventional Radiography of Scaphoid Fractures. AJR Am J Roentgenol. 2004;182(1):155-9doi:10.2214/ajr.182.1.1820155 - Pubmed
15. Hunter J, Escobedo E, Wilson A, Hanel D, Zink-Brody G, Mann F. MR Imaging of Clinically Suspected Scaphoid Fractures. AJR Am J Roentgenol. 1997;168(5):1287-93.doi:10.2214/ajr.168.5.9129428-Pubmed
16. Khalid M, Jummani Z, Kanagaraj K, Hussain A, Robinson D, Walker
17. R. Role of MRI in the Diagnosis of Clinically Suspected Scaphoid Fracture: Analysis of 611 Consecutive Cases and Literature Review Emer Med J.doi:10.1136/emj.2008.058750-Pub Med
18. Memarsadeghi M, Breitenseher M, Schaefer-Prokop C et al. Occult Scaphoid Fractures: Comparison of Multidetector CT and MR Imaging--Initial Experience. Radiology. 2006;240(1):169-76. doi:10.1148/radiol.2401050412 - Pubmed
19. Brydie A & Raby N. Early MRI in the Management of Clinical Scaphoid Fracture. Br J Radiol. 2003;76(905):296-300.

    doi:10.1259/bjr/19790905 - Pubmed
20. Goldfarb C, Yin Y, Gilula L, Fisher A, Boyer M. Wrist Fractures: What the Clinician Wants to Know. Radiology. 2001;219(1):11-28. doi:10.1148/radiology.219.1.r01ap1311 - Pubmed
21. Philip Robinson. Essential Radiology for Sports Medicine. (2010) ISBN: 9781441959720 - Google Books

e) Closed Fracture of Carpal Bone

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	Carpal bone fracture non-displaced
Activity	**Work Process**
Perform Procedure	1. Various techniques can be employed; however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant perform reduction by inline traction and realign 5. Apply Plaster cast (refer chapter 2.1.4/ 2.1.5/ 2.1.6)
References	1. Walenkamp MM, Bentohami A, Slaar A et-al. The Amsterdam wrist rules: the multicenter prospective derivation and external validation of a clinical decision rule for the use of radiography in acute wrist trauma. BMC Musculoskelet Disord. 2015;16 (1): 389. doi:10.1186/s12891015-0829-2 - Free text at pubmed - Pubmed citation 2. Bentohami A, Walenkamp MM, Slaar A et-al. Amsterdam wrist rules: a clinical decision aid. BMC Musculoskelet Disord. 2011;12 (1): 238. doi:10.1186/1471-2474-12-238 - Free text at pubmed - Pubmed citation 3. Kaewlai R, Avery LL, Asrani AV, Abujudeh HH, Sacknoff R, Novelline RA. Multidetector CT of carpal injuries: anatomy, fractures, and fracture-dislocations. Radiographics: a review publication of the Radiological Society of North America, Inc. 28 (6): 177184. doi:10.1148/rg.286085511 - Pubmed 4. Scalcione LR, Gimber LH, Ho AM, Johnston SS, Sheppard JE, Taljanovic MS. Spectrum of carpal dislocations and fracturedislocations: imaging and management. AJR. American journal of roentgenology. 203 (3): 541-50.doi:10.2214/AJR. 13.11680 - Pubmed 5. You JS, Chung SP, Chung HS, Park IC, Lee HS, Kim SH. The usefulness of CT for patients with carpal bone fractures in the emergency department. Emergency medicine journal: EMJ. 24 (4): 248-50. doi:10.1136/emj.2006.040238 - Pubmed

f) Closed Fracture of Phalanges

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	Non displaced intraarticular fractures 1. Proximal 2. Middle 3. Distal
Activity	**Work Process**
Perform procedure	1. Various techniques can be employed; however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant perform reduction by inline traction and realign 5. Apply splint (refer chapter 5.1 / 5.2)
Reference	1. Bachoura A, Ferikes AJ, Lubahn JD. A review of mallet finger and jersey finger injuries in the athlete. Curr Rev Musculoskelet Med. 2017 Mar;10(1):1-9. [PMC free article] [PubMed] 2. Angermann P, Lohmann M. Injuries to the hand and wrist. A study of 50,272 injuries. J Hand Surg Br. 1993 Oct;18(5):6424. [PubMed] 3. Chung KC, Spilson SV. The frequency and epidemiology of hand and forearm fractures in the United States. J Hand Surg Am. 2001 Sep;26(5):908-15. [PubMed] 4. Yee J, Waseem M. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Aug 8, 2022. Mallet Finger Injuries. [PubMed] 5. Packer GJ, Shaheen MA. Patterns of hand fractures and dislocations in a district general hospital. J Hand Surg Br. 1993 Aug;18(4):511-4. [PubMed] 6. Lee SG, Jupiter JB. Phalangeal and metacarpal fractures of the hand. Hand Clin. 2000 Aug;16(3):323-32, vii. [PubMed] 7. Zook EG, Guy RJ, Russell RC. A study of nail bed injuries: causes,treatment, and prognosis. J Hand Surg Am. 1984 Mar;9(2):247-52, [PubMed] 8. Khalid S, Khalid M, Zaheer S, Ahmad I, Ullah E. Kirner's Deformity Misdiagnosed as Fracture: A Case Report. Oman Med J. 2012 May;27(3):237-8. [PMC free article] [PubMed]

9. erranova WA, Williams GS, Kuhlman TA, Morgan RF. Acute phalangeal fractures due to undiagnosed sarcoidosis. J Hand Surg Am. 1985 Nov;10(6 Pt 1):902-3. [PubMed]

10. Garon MT, Massey P, Chen A, Carroll T, Nelson BG, Hollister AM. Cost and Complications of Percutaneous Fixation of Hand Fractures in a Procedure Room Versus the Operating Room. Hand (N Y). 2018 Jul;13(4):428-434. [PMC free article] [PubMed]

11. Ataker Y, Uludag S, Ece SC, Gudemez E. Early active motion after rigid internal fixation of unstable extra-articular fractures of the proximal phalanx. J Hand Surg Eur Vol. 2017 Oct;42(8):803809. [PubMed]

12. Oosterhoff TC, Nota SP, Ring D. Finger Stiffness. J Hand Microsurg.2015 Jun;7(1):13-7. [PMC free article] [PubMed]

PERFORM PROCEDURE:

1.1 : CLOSED MANIPULATION AND REDUCTION (CMR) FRACTURE

1.1.2 : LOWER LIMB

a) CMR Closed Fracture of Femur (Peadiatric)

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	Simple fracture with minimal displaced 1. Proximal 2. Mid shaft 3. Distal
Activity	**Work Process**
Perform procedure	1. Various techniques can be employed however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant perform reduction by inline traction and realign 5. Apply plaster cast (refer chapter 2.2.10)
Reference	1. Femur Shaft Fractures (Broken Thighbone) (American Academy of Orthopaedic Surgeons) Leg Injuries and Disorders/Specifics ... Leg Injuries and Disorders ... American Academy of Orthopaedic Surgeons...The long, straight part of the femur (thighbone)...https://orthoinfo.aaos.org/...femur-shaft-fractures-brokenthighbone 2. Bridgman S, Wilson R. Epidemiology of femoral fractures in children in the West Midlands region of England 1991 to 2001. *Journal of Bone and Joint Surgery British Volume.* 2004;86(8):1152–1157. doi: 10.1302/0301-620X.86B8.14810. [PubMed] [CrossRef] [Google Scholar] 3. Sanzarello I, Calamoneri E, D'Andrea L, Rosa MA. Algorithm for the management of femoral shaft fractures in children. *Musculoskeletal Surgery.* 2014;98(1):53–60. doi: 10.1007/s12306-013-02993. [PubMed] [CrossRef] [Google Scholar]y. 4. Hinton RY, Lincoln A, Crockett MM, Sponseller P, Smith G. Fractures of the femoral shaft in children. Incidence, mechanisms,and sociodemographic risk factors. *The Journal ofBone and Joint Surgery.* 1999;81(4):500–509. doi: 10.2106/00004623-199904000-00007. [PubMed] [CrossRef] [Google Scholar]

5. Poolman RW, Kocher MS, Bhandari M. Pediatric femoral fractures: A systematic review of 2422 cases. *Journal of Orthopaedic Trauma.* 2006;20(9):648–654. [PubMed] [Google Scholar]

6. Hosalkar HS, Pandya NK, Cho RH, Glaser DA, Moor MA, Herman MJ. Intramedullary nailing of pediatric femoral shaft fracture. *Journal of American Academy of Orthopaedic Surgeons.* 2011;19(8):472–481. doi: 10.5435/00124635-201108000-00003. [PubMed] [CrossRef] [Google Scholar]

7. Anderson WA. The significance of femoral fractures in children. *Annals of Emergency Medicine.* 1982;11(4):174–177. doi: 10.1016/S0196-0644(82)80492-7. [PubMed] [CrossRef] [Google Scholar]

8. Nafei A, Teichert G, Mikkelsen SS, Hvid I. Femoral shaft fractures in children: an epidemiological study in a Danish urban population, 1977–86. *Journal of Pediatric Orthopedics.* 1992;12(4):499–502. doi: 10.1097/01241398-199207000-00016. [PubMed] [CrossRef] [Google Scholar]

9. Thomas SA, Rosenfield NS, Leventhal JM, Markowitz RI. Long-bone fractures in young children: Distinguishing accidental injuries from child abuse. *Pediatrics.* 1991;88(3):471–476. [PubMed] [Google Scholar]

10. Khoriati AA, Jones C, Gelfer Y, Trompeter A. The management of paediatric diaphyseal femoral fractures: A modern approach. *Strategies in Trauma and Limb Reconstruction.* 2016;11(2):87–97. doi: 10.1007/s11751-016-0258-[PMC free article] [PubMed] [CrossRef] [Google Scholar]

b) Closed Fracture of Tibia/Fibula

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	Simple fracture with minimal displaced 1. Proximal 2. Mid Shaft 3. Distal
Activity	**Work Process**
Perform procedure	1. Various techniques can be employed however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant perform reduction by inline traction and realign 5. Apply plaster cast (refer chapter 2.1 – 2.2)
Reference	1. Tibia (Shinbone) Shaft Fractures (American Academy of Orthopaedic Surgeons) Leg Injuries and Disorders/Specifics... Leg Injuries and Disorders ... American Academy of Orthopaedic Surgeons ... A tibial shaft fracture occurs along the length...https://orthoinfo.aaos.org/.../tibia-shinbone-shaft-fractures 2. Cummings RJ, Shea KG. Distal tibial and fibular fractures. In *Rockwood and Wilkins' Fractures in Children*, 7th Ed. Beaty JH, Kasser JR (Eds). Lippincott Williams & Wilkins, Philadelphia 2010. p.967-1016. 3. Schnetzler KA, Hoernschemeyer D. The pediatric triplane ankle fracture. *J Am Acad Orthop Surg* 2007; 15(12): 738-47.

c) Closed Fracture of Metatarsal

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	First metatarsal • Non-displaced fractures Second through fourth (central) metatarsals • Isolated fractures • Non-displaced or minimally displaced fractures
Activity	**Work Process**
Perform procedure	1. Various techniques can be employed however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant perform reduction by inline traction and realign 5. Apply plaster cast (refer chapter 2.2.2/ 2.2.6)
Reference	1. Anderson LD. Injuries of the forefoot. Clin Orthop Relat Res. 1977 Jan-Feb;(122):18-27. [PubMed] 2. Reichelt A, Derkmann G. [Therapy of metatarsal fractures]. Arch Orthop Unfallchir. 1972;72(2):139-55. [PubMed] 3. Gösele A, Schulenburg J, Ochsner PE. [Early functional treatmentof a 5th metatarsal fracture using an orthopedic boot]. Swiss Surg. 1997;3(2):81-4. [PubMed] 4. Rammelt S, Heineck J, Zwipp H. Metatarsal fractures. Injury. 2004 Sep;35 Suppl 2:SB77-86. [PubMed] 5. Dameron TB. Fractures and anatomical variations of the proximal portion of the fifth metatarsal. J Bone Joint Surg Am. 1975 Sep;57(6):788-92. [PubMed] 6. Quill GE. Fractures of the proximal fifth metatarsal. Orthop Clin North Am. 1995 Apr;26(2):353-61. [PubMed] 7. Patel R, Haddad F. Metatarsal fractures. Br J Hosp Med (Lond). 2006 Jul;67(7):M130-3. [PubMed]

PERFORM PROCEDURE

1.2 : CLOSED MANIPULATION AND REDUCTION (CMR) OFJOINT DISLOCATION

1.2.1 : UPPER LIMB

a) Shoulder Joint Dislocation

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	1. Anterior shoulder dislocation 2. Posterior shoulder dislocation
Activity	**Work Process**
Perform procedure	Various techniques can be employed; however, all techniques aim at providing sufficient traction during manipulation **Hennepin Technique** **a) Anterior shoulder dislocation** **Position** - Position the patient supine (typically) or seate - Position the affected arm with the humerus in adduction, the elbow flexed at 90° (to relax the long head of the biceps and facilitate movement of the humeral head), and the wrist in a neutral position - Neurovascular examination - Intra-articular analgesia **Reduce the shoulder** - With one hand, hold the affected upper arm adducted against the patient's side - With your other hand, gently hold the patient's wrist, keeping the elbow flexed at 90° and the forearm neutral (thumb pointing upward) - Instruct the patient to relax the arm while you guide it through the maneuver ; Rotate the arm externally slowly and gently, applying minimal force to the volar surface of the wrist, as if guiding it through passive external rotation - Continue until the forearm is close to the coronal plane, achieving approximately 90° of external rotation **If the patient experiences pain or muscle spasm,** momentarily pause and keep the arm motionless. This allows the patient to focus relaxing, facilitating the resolution of muscle spasm

c) Closed Fracture of Metatarsal

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	First metatarsal • Non-displaced fractures Second through fourth (central) metatarsals • Isolated fractures • Non-displaced or minimally displaced fractures
Activity	**Work Process**
Perform procedure	1. Various techniques can be employed however, all techniques aim at providing sufficient traction during manipulation 2. The first assistant hold the affected limb carefully and make a pull/traction 3. With the help of second assistant, carefully hold the affected limb and provide counter traction 4. The third assistant perform reduction by inline traction and realign 5. Apply plaster cast (refer chapter 2.2.2/ 2.2.6)
Reference	1. Anderson LD. Injuries of the forefoot. Clin Orthop Relat Res. 1977 Jan-Feb;(122):18-27. [PubMed] 2. Reichelt A, Derkmann G. [Therapy of metatarsal fractures]. Arch Orthop Unfallchir. 1972;72(2):139-55. [PubMed] 3. Gösele A, Schulenburg J, Ochsner PE. [Early functional treatmentof a 5th metatarsal fracture using an orthopedic boot]. Swiss Surg. 1997;3(2):81-4. [PubMed] 4. Rammelt S, Heineck J, Zwipp H. Metatarsal fractures. Injury. 2004 Sep;35 Suppl 2:SB77-86. [PubMed] 5. Dameron TB. Fractures and anatomical variations of the proximal portion of the fifth metatarsal. J Bone Joint Surg Am. 1975 Sep;57(6):788-92. [PubMed] 6. Quill GE. Fractures of the proximal fifth metatarsal. Orthop Clin North Am. 1995 Apr;26(2):353-61. [PubMed] 7. Patel R, Haddad F. Metatarsal fractures. Br J Hosp Med (Lond). 2006 Jul;67(7):M130-3. [PubMed]

	while you manually apply axial traction to the arm - Utilize a second assistant to push upward (anteriorly) on the posterior aspect of the humeral head - If necessary, the second assistant can also gently apply a lateral force to the upper humerus, leveraging the humeral head laterally towards the glenoid fossa if it is locked on the posterior glenoid - After dislodging the humeral head, apply slight external rotation to complete the reduction - Immobilize the shoulder in external rotation (20°) and slight abduction using a sling or shoulder immobilizer
Reference	1. https://www.msdmanuals.com/professional/injuries-poisoning/howto-reduce-dislocations-and-subluxations/how-to-reduce- anteriorshoulder-dislocations Matthew J. Streitz ,MD, San AntonioUniformed Services Health Education. 2. https://www.mayoclinic.org/diseases-conditions/dislocated shoulder *3.* https://www.msdmanuals.com/professional/injuries-poisoning/how-to-reduce-dislocations-and-subluxations/how-toreduce-posterior-shoulder-dislocations Matthew J. Streitz ,MD, San Antonio UniformedServices Health Education Consortium

b) Elbow Joint Dislocation

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	Posterior elbow dislocation
Activity	**Work Process**
Perform procedure	Various techniques can be employed however, all aim to provide sufficient traction during manipulation **Posterior elbow reduction** **Position** - Position the patient prone on the stretcher with the elbow flexed and the forearm hanging over the edge - Raise the stretcher to your pelvic level, lock the wheels of the stretcher - If the patient cannot lie prone or if the prone position reduction attempt fails, perform the reduction with the patient in a supine or reclining position **Reduce the elbow-prone position** - Place the patient prone, with the forearm dangling over the side of the stretcher - Stabilize the affected upper arm against the stretcher with an assistant, wrapping both hands around the distal humerus, and use the thumbs to apply pressure to distract the posterior aspect of the olecranon - Apply steady downward traction to the forearm while maintaining elbow flexion. Successful reduction is often indicated by a lengthening of the forearm and a perceptible 'clunk' - If the joint is not reduced, have the assistant lift the humerus while maintaining downward pressure on the olecranon, as you attempt to further flex the elbow - Maintain these forces on the elbow for up to 10 minutes if needed - If the initial approach does not reduce the dislocation, consider a traction-counter traction technique with the patient in a supine position

	Reduce the elbow — supine position - Position the patient supine and have an assistant stabilize the humerus with both hands - Grasp the patient's wrist, keep it supinated, apply steady axial traction, and slightly flex the elbow to keep the triceps muscles loose - Maintain these forces on the elbow for up to 10 minutes if needed - Successful reduction is typically indicated by forearm lengthening and a perceptible 'clunk.' Immobilize the elbow at approximately 90° of flexion with the forearm in a neutral position or pronation, using a posterior long arm splint. Avoid using a circumferential cast
Reference	1. https://www.msdmanuals.com/professional/injuries-poisoning/how-to reduce-dislocations-and-subluxations/how-to-reduce-a-posteriorelbow-dislocation 2. Robinson PM, Griffiths E, Watts AC. (2017). Simple elbow dislocation. Shoulder & Elbow. 9(3):195-204. https://doi.org/10.1177/1758573217694163 3. https://www.orthobullets.com/evidence/9692937 4. https://www.ncbi.nlm.nih.gov/books/NBK470574/

c) Interphalangeal joint (IPJ) dislocation

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	All interphalangeal joint dislocation
Activity	**Work Process**
Perform procedure	Various techniques can be employed however, all involve ensuring sufficient traction and manipulation under anesthesia **1. Proximal interphalangeal joint** 1.1 **Dorsal dislocation** To reduce a dorsal dislocation of the proximal interphalangeal (PIP) joint, apply longitudinal traction with hyperextension, followed by pressure on the dorsal aspect of the base of the middle phalanx as the finger is flexed. Apply a dorsal splint with 20°- 30° of flexion 1.2 **Lateral dislocation** Apply longitudinal traction and ulna or radial stress to the finger, depending on the initial direction of injury. A partial tear can be buddy-taped, and a reduced dislocation (i.e., complete tears) should be splinted 1.3 **Volar dislocation** Apply mild traction with the PIP and metacarpophalangeal (MCP) joints flexed. Splint only the PIP joint in full extension **2. Distal interphalangeal joint** To reduce a dislocated distal interphalangeal (DIP) joint, apply gentle longitudinal traction with hyperextension (if dorsal dislocation) or hyperflexion (if volar dislocation). Follow with pressure to the base of the distal phalanx in the direction that realigns the phalanges
Reference	1. Leah Ahn,Blomberg Joshua (2023 Feb 26) Phalanx dislocation https://www.orthobullets.com/hand/6038/phalanx-dislocation 2. Muhammad Taqi;Amie Collins 2022 Nov 20) Finger dislocation Statpearls https://www.ncbi.nlm.nih.gov/books/NBK551508/#:~:text=Dorsal%20DIP%20joint%20dislocation

1.2 : CLOSED MANIPULATION AND REDUCTION (CMR) OF JOINT DISLOCATION

1.2.2 : Lower limb

a) Hip joint dislocation

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	Hip dislocation 1. Anterior hip dislocation 2. Posterior hip dislocation
Activity	**Work Process**
Perform procedure	Various techniques can be employed however, all aim to provide sufficient traction during manipulation **1. Closed reduction for anterior dislocations** 1.1 **Allis Leg Extension Method:** The patient is supine, and the physician, either climbing on the stretcher or standing on the affected side, applies inline traction to the ipsilateral knee with an assistant stabilizing the patient's pelvis until the hip is reduced. For pubic-type dislocations, hip hyperextension is required for reduction 1.2 **Reverse Bigelow Method:** The patient is supine, and the physician grasps the ipsilateral limb at the ankle with one hand while placing the free hand behind the knee. Traction is applied in line with the deformity, and the hip is adducted, internally rotated, and extended. If climbing on the stretcher is not necessary, standing on the side is preferred for physician safety 1.3 **Lateral Traction Method:** The patient is supine, and the assistant wraps a cloth around the ipsilateral inner thigh. The physician applies longitudinal force along the femur, while the assistant pulls on the cloth to apply lateral traction for hip reduction. External rotation is used as needed to assist in the reduction **2. Closed Reduction for Posterior Dislocations** 2.1 **Allis Maneuver:** The patient is in a supine position, with the physician standing above. The physician applies inline traction on the ipsilateral leg, flexing the knee to 90°, while an assistant stabilizes the pelvis against the stretcher for counter traction. Gentle extension of the ipsilateral leg with external rotation facilitates hip reduction, marked by an audible 'clunk' with successful reduction

	2.2 **Bigelow Maneuver:** With the patient in a supine position, the physician grasps the ipsilateral limb at the ankle with one hand and places the free hand behind the knee. An assistant applies downward force on the anterior superior iliac spine for counter traction. The physician applies inline longitudinal traction, flexing the patient's knee to 90°. As the limb reduces, the physician applies gentle extension, abduction, and external rotation for the femoral head to move into the acetabulum. Physicians should stand on the side of the bed during this maneuver for enhanced safety
Reference	1. Clegg TE, Roberts CS, Greene JW, Prather BA. Hip dislocations—epidemiology, treatment, and outcomes. *Injury*. 2010. April;41(4):329-334. doi: 10.1016/j.injury.2009.08.007. 2. Waddell BS, Mohamed S, Glomset JT, Meyer MS. A detailed review of hip reduction maneuvers: a focus on physician safety and introduction of the Waddell technique. Orthop Rev (Pavia). 2016. March 21;8(1):6253. doi: 10.4081/or.2016.6253. 3. Bigelow H. On dislocation of the hip. Lancet. 1878. June;111(2859):860-862. doi: 10.1016/S0140-6736(02)43952-9. 4. Polesky RE, Polesky FA. Intrapelvic dislocation of the femoral head following anterior dislocation of the hip. A case report. J Bone Joint Surg Am. 1972. July;54(5):1097-1098. 5. Allis OH. The Hip. Philadelphia, PA: Dorman Printer; 1895:14-26.

b) Knee Joint Dislocation

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	1. Anterior knee dislocation 2. Posterior knee dislocation
Activity	**Work Process**
Perform procedure	Various techniques can be employed; however, all aim to provide sufficient traction during manipulation **1. Knee joint reduction** 1.1 Apply longitudinal traction to the tibia, which may be sufficient, especially in cases of severe ligament damage 1.2 If traction is not successful, the next step is to reverse the direction of the dislocation a) Anterior dislocation: lift the distal femur and push the tibia posteriorly b) Posterior dislocation: place pressure over the distal femur and lift the tibia anteriorly c) Rotatory dislocations: rotate the tibia back towards its natural position **2. Closed reduction** Approach a) Anterior dislocation - traction and anterior translation of the femur b) Posterior dislocation - traction, extension, and anterior translation of the tibia c) Medial/lateral - traction and medial or lateral translation d) Rotatory - axial limb traction and rotation in the opposite direction of deformity e) Splinting 20° to 30° of flexion
Reference	1. https://www.orthobullets.com/trauma/1043/knee-dislocation 2. ncbi.nlm.nih.gov/pmc/articles/PMC2850837/#:~ text=Management %20 is%20early%20knee% 20relocation, for%20any% 20popliteal%20 arterial%20injury. 3. https://www.msdmanuals.com/professional/injuries-poisoning/howto-reduce-dislocations-and-subluxations/how-to-reduce-a-lateralpatellardislocation#:~:text=Gently%20extend%20the%20lower %20leg,locati on%20between%20the%20femoral%20condyles. https://emedicine.medscape.com/article/823589-treatment

c) Ankle joint dislocation

Objective	To reduce deformity and immobilize, in order to restore the physiological anatomy of the structure and minimize complications
Indication	1. Anterior ankle dislocation 2. Posterior ankle dislocation
Activity	**Work Process**
Perform procedure	Various techniques can be employed however, all aim to provide sufficient traction during manipulation **1. Ankle dislocation :** - Place a pillow behind the knee of the affected leg to flex both the hip and the knee - Have one assistant grasp the calf with both hands, ready to pull cephalad (counter traction) - A second assistant should grasp the ankle with one hand for lower leg stabilization - Grasp the foot with one hand at the heel and the other hand at the forefoot **2. Posterior dislocation :** - Free the talus from the distal tibia by slightly plantarflexing the foot and axially distracting the heel away from the tibia. The first assistant provides axial counter traction to the calf - While maintaining axial distraction of the heel, the second assistant applies a counterforce to the anterior ankle. Dorsiflex the foot to reposition the talar dome anteriorly into the joint mortice **3. Anterior dislocation :** - Dorsiflex the foot to distract the talus from the tibia - Apply axial traction and push the foot directly backward, while an assistant provides counter traction to the posterior part of the leg **4. Lateral dislocation :** - Axially distract the heel from the tibia, then move the foot medially and dorsiflex it *All Dislocations Successful reduction may result in a perceptible 'clunk'

References	1. https://www.msdmanuals.com/professional/injuriespoisoning/how-to-reduce-dislocations-and-subluxations/how-toreduce-an-ankledislocation#:~:text=Most%20ankle%20dislocations%20are%20fracture,reduction%20until%20definitive%20orthopedic%20treatment. 2. https://www.orthobullets.com/trauma/1043/knee-dislocation 3. https://www.hopkinsmedicine.org/health/conditions-anddiseases/knee-injuries 4. https//myoutube.com.larry b mellick

CHAPTER 2 : APPLICATION OF PLASTER CAST AND PLASTER SLAB

2.1. Upper Limb

2.1.1 Hanging Cast

2.1.2 Above Elbow Cast

2.1.3 Below Elbow Cast

2.1.4 Scaphoid Cast

2.1.5 Bennett's Cast

2.1.6 U-Slab

2.1.7 Above Elbow Slab

2.1.8 Below Elbow Slab

2.1.9 Volar Slab

2.1.10 Dorsal Slab

2.1.11 Ulnar Gutter Slab

2.2. Lower Limb

2.2.1 Above Knee Cast

2.2.2 Below Knee Cast

2.2.3 Cylinder Cast

2.2.4 Patella Tendon Bearing (PTB) Cast

2.2.5 Above Knee Slab

2.2.6 Below Knee Slab

2.2.7 Cylinder Slab

2.2.8 Body Cast

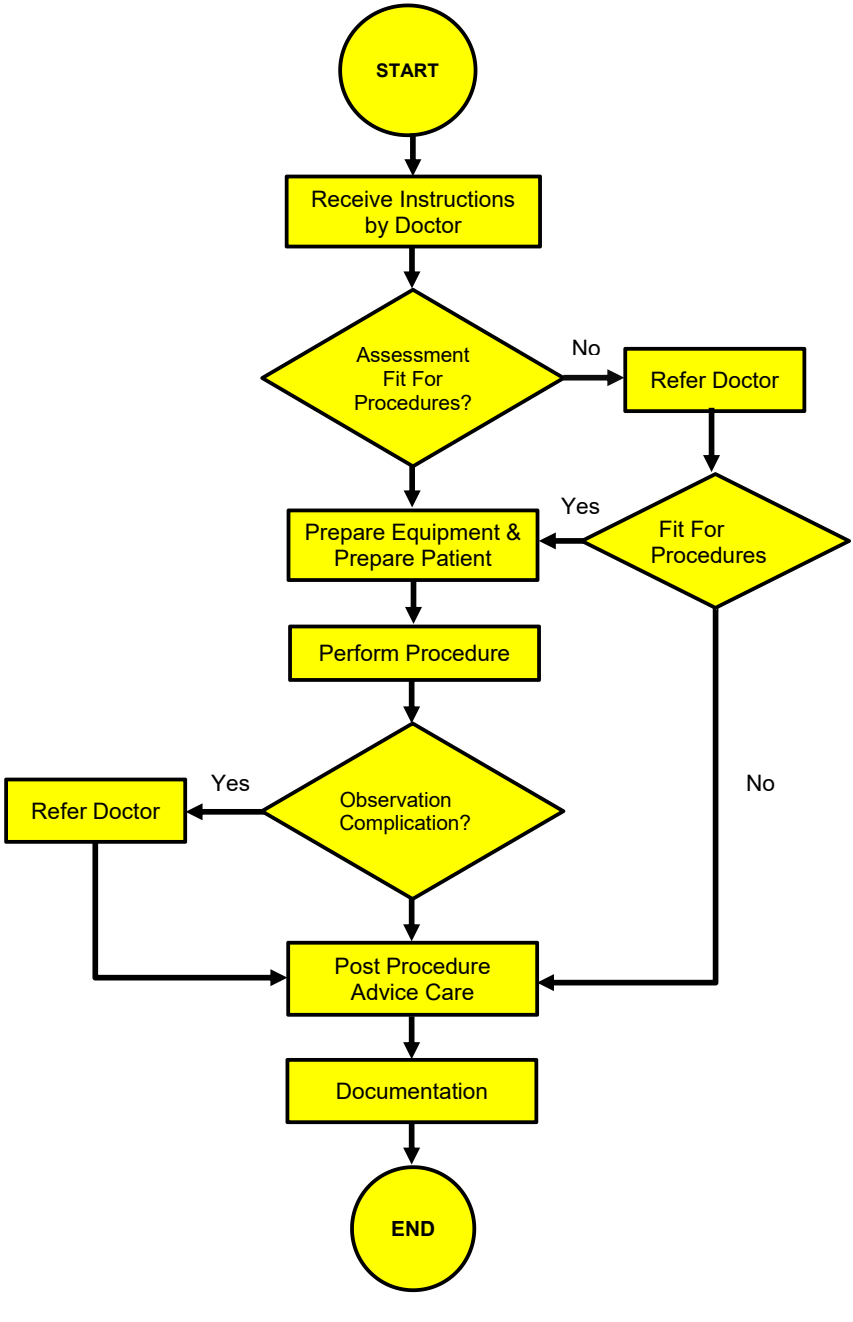
2.2.9 Posterior Tibial Support Cast

2.2.10 Unilateral/Bilateral Hip Spica

2.2.11 Congenital Talipes Equino Valrus (CTEV) Cast

***All procedure in this chapter need more than 1 healthcare provider to perform**

CHAPTER 2
FLOWCHART APPLICATION OF PLASTER CAST AND BACK SLAB (UPPER LIMBS & LOWER LIMBS)



CHAPTER 2: WORK PROCESS APPLICATION OF PLASTER CAST AND BACK SLAB (UPPER LIMBS & LOWER LIMBS)

Objective	Alignment, immobilize and stabilize		
Indication	Fracture, severe sprain, dislocation, protection of post operative repair and gradual correction of deformity		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read instruction 2. Register patient		1. Patient record system 2. Order slip
2. Assessment /Examination	1. Review the X-ray 2. Confirm the fracture site 3. Assess skin condition of the limb 4. Check for abnormalities in the casting application 4.1. Swollen 4.2. Bruises 4.3. Numbness 4.4. Blister 4.5. Tense 4.6. Reduced sensation 4.7. Reduced pulse 5. Check pulse, Capillary Refill Time (CRT), and movement of the limb 6. Pain score 7. Refer the patient to a doctor if any abnormalities are found, as the patient might not be fit for the procedure 8. If the patient is fit for the procedure, continue to prepare the equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO.01/17 MOH 3. Pain score scale

3. Prepare equipments and patient	1. Ensure the POP trolley is fully equipped and functional 2. Correct patient 3. Order slip 4. Explain to patient/relative 5. Confirm with patient the affected limb 6. Remove accessories if present 7. Position the patient comfortably 8. Place the linen protector under the injured limb		**1.** POP trolley **REFER APPENDIX 1** 2. Spica table (if available) 3. Personal Protection Equipment 4. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast : PPP.ORTHO.01/17MOH
4. Perform Procedure	**Refer Application of Plaster Cast and Back Slab (Upper Limbs & Lower Limbs)** **Chapter 2** **Work Procedure (2.1- 2.2)**		1. X-ray Film (Pre & post reduction) - AP view - Lateral view 2. Personal Protection Equipment
5. Observation	1. Observe, record neurovascular status 2. Pain Score 3. Refer the doctor if any complication arises	1. Pain as The 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
6. Post procedure advice care	1. Wound care 2. Encourage movement of extremities 3. Care of splint 4. Advise the patient to come to the Orthopedic Outpatient Clinic or Emergency Department immediately if they develop any: 4.1 Swelling 4.2 Severe pain 4.3 Numbness	1. Orthopaedic advice slip must given to patient 2. Standard Wound Care Manual	1. Health Education. LPP.ORTHO.02/17 (Orthopedic Advice Slip)

	4.4 Monitor for any change in color of extremities 4.5 Fever 4.6 Foul smell		
7. Documentation	1. Document the procedure		1. Procedure record system 2. Procedure book
8. Reference	1. Panduan Praktikal Pemasangan Plaster Kast (KKM) Edisi ke 2(2012) 2. SOP for Medical Asisstant in First Edition of Orthopedic (2006) 3. Pain The 5th Vital Sign third Edition (2018) 4. Policies & Procedures on Infection Prevention and Control (KKM) (2019) 5. AO Trauma Casts, Splints, And Support Bandages – Non operative Treatment and Perioperative Protection		

PERFORM PROCEDURE APPLICATION OF PLASTER CAST
2.1 : UPPER LIMBS

2.1.1 Hanging Cast

Objective	To re-align and immobilize fracture of humerus
Indication	Fracture humerus (distal to midshaft)
Activity	**Work Process**
Perform procedure	1. With the assistance of another person, securely hold the limb. The patient should be in an upright or semi-erect position throughout the procedure. 2. Apply the hanging arm cast with the elbow at a 90° flexion and the forearm in a neutral rotation. 3. Wrap the limb with orthoban, starting from the wrist joint and extending to the proximal humerus. 4. Apply the plaster of Paris (POP) until it reaches 2 fingerbreadths from the proximal humerus. 5. Position the hook approximately 2 fingerbreadths from the distal end of the POP. 6. Complete the application by adding the final layer of POP. 7. Secure the collar and cuff using the hook. Ensure that the affected upper limb is in a hanging position. 8. Adjust the position of the hook based on the current fracture and displacement. 9. Clean the affected limb after the cast application. 10. Allow the plaster of Paris to harden for 5 to 10 minutes after application.
Reference	1. Prakash, L., Dhar, S. A. (2022). Non operative management of fractures of the humerus evaluation of a new extension casting method. Acta Orthopaedical Belgica, 88(1), 151-159. https://doi.org/10.52628/88.1.19 2. Fractures of the humeral shaft Cowling, P. (2019). Fractures of the humeral shaft. Orthopedics and Trauma, 33(5), 283-293. https://doi.org/10.1016/j.mporth.2019.07.003 3. Wijesekera, M. P., Cowling, P. (2023). Update on management options for the humeral shaft. Orthopedics and Trauma, 37(5), 303-313.https://doi.org/10.1016/j.mporth.2023.07.006

2.1.2 Above Elbow Cast

Objective	To stabilize and immobilize
Indication	1. Forearm fractures (example: distal humerus, isolated midshaft or distal ulna fractures) 2. Radius and ulna fractures
Activity	**Work Process**
Perform procedure	1. With the help of an assistant hold the limb firmly. Position patient in supine position a) First Health Care Worker : - While facing the patient, hold affected patient hand - One hand holds the thumb and the other hand holds the index, middle-end and ring fingers together b) Second Health Care Worker - The elbow should always be angle at 90° - The position of forearms depending on the fracture location: • Neutral position for midshaft fracture c) Assistant Medical Officer - Start wrapping the orthoban from distal metacarpophalangeal joints (MCPJ) to proximal (elbow level) and from the inside out - Start wrapping the POP from MCP joint inwards. Do not go beyond the orthoban end - Continue wrapping POP until close to elbow till two finger breath from the elbow - Smoothen and mould POP so that the inner layer is dense and not rough after each roll 2. After applying the cast, ensure the affected limb is cleaned 3. Let the plaster of Paris (POP) harden before putting on the arm sling
Reference	1. Drozd, M., Miles, S., & Davies, J. (2009). Casting: above-elbow back slabs: Mary Drozd and colleagues continue their series on good practice in casting with a review of the application of above-elbow back slabs. Emergency Nurse, 17(4), 20+. https://link.gale.com/apps/doc/A203953568/AONE?u=googlescholar&sid=bookmark-AONE&xid=9a23c05c

2. Jogani, A. D., Rathod, T. N., Shende, C. V. (2019). How long does treated supracondylar humerus fracture in children take to recover elbow range? International Journal of Research in Orthopaedics, 5 (5), 860

2.1.3 Below Elbow Cast

Objective	To stabilize and immobilize
Indication	Distal radius fracture and carpal bone fracture
Activity	**Work Process**
Perform procedure	1. With the help of an assistant, hold the limb firmly and position the patient in a supine position a) First Assistant: I. While facing the patient, hold the affected patient's hand II. With one hand, hold the thumb, and with the other hand, hold the index, middle, and ring fingers together b) Second Assistant I. Maintain of traction d) Assistant Medical Officer II. Start wrapping the orthoban from distal metacarpal phalangeal joint (MCPJ) to proximal (elbow level) and from the inside out III. Startr wrapping the POP from MCP joint inward. Do not go beyond the orthoban end IV. Continue wrapping POP until close to elbow till two fingerbreadth from the elbow V. Smoothen and mould POP so that the inner layer is dense and nor rough after each roll 2. Clean affected limb after applying cast 3. Allow the POP to harden before apply arm sling
Reference	1. Andreotti M, Tonon F, Caruso G, et al. The “Chauffeur Fracture”: historical origins of an often-forgotten eponym. Hand (N Y). 2018:1558944718792650. [PMC free article] [PubMed] 2. Nellans KW, Kowalski E, Chung KC. The epidemiology of distal radius fractures. Hand Clin. 2012;28(2):113–125. doi: 10.1016/j.hcl.2012.02.001. [PMC free article] [PubMed] [CrossRef] [Google Scholar] 3. Porrino JA, Jr, Maloney E, Scherer K, et al. Fracture of the distal radius: epidemiology and premanagement radiographic

characterization. AJR Am J Roentgenol. 2014;203(3):551–559. doi: 10.2214/AJR.13.12140. [PubMed] [CrossRef] [Google Scholar]

4. Jupiter J. Future treatment and research directions in distal radius fracture. Hand Clin. 2012;28(2):245–248. doi: 10.1016/j.hcl.2012.02.006. [PubMed] [CrossRef] [Google Scholar]
5. Chen CW, Huang TL, Su LT, et al. Incidence of subsequent hip fractures is significantly increased within the first month after distal radius fracture in patients older than 60 years. J Trauma Acute Care Surg. 2013;74(1):317–321. doi: 10.1097/TA.0b013e31824bb325. [PubMed] [CrossRef] [Google Scholar]
6. Belloti JC, Santos JB, Atallah AN, et al. Fractures of the distal radius (Colles' fracture) Sao Paulo Med J. 2007;125(3):132–138. doi: 10.1590/S1516-31802007000300002. [PubMed] [CrossRef] [Google Scholar]
7. Mauck BM, Swigler CW. Evidence-based review of distal radius fractures. Orthop Clin North Am. 2018;49(2):211–222. doi: 10.1016/j.ocl.2017.12.001. [PubMed] [CrossRef] [Google Scholar]
8. Sarmiento A, Pratt GW, Berry NC, et al. Colles' fractures. Functional bracing in supination. J Bone Joint Surg Am. 1975;57(3):311–317. doi: 10.2106/00004623-197557030-00004. [PubMed] [CrossRef] [Google Scholar]
9. Bünger C, Sølund K, Rasmussen P. Early results after Colles' fracture: functional bracing in supination vs dorsal plaster immobilization. Arch Orthop Trauma Surg. 1984;103(4):251–256. doi: 10.1007/BF00387330. [PubMed] [CrossRef] [Google Scholar]
10. Pool C. Colles's fracture. A prospective study of treatment. J Bone Joint Surg Br. 1973;55(3):540–544. doi: 10.1302/0301-620X.55B3.540. [PubMed] [CrossRef] [Google Scholar

2.1.4 Scaphoid Cast

Objective	To stabilize and immobilize fracture
Indication	Scaphoid fracture
Activity	**Work Process**
Perform procedure	1. Assist in firmly holding the limb with the help of an assistant 2. Wrap orthoban start from metacarpophalangeal joints (MCPJ) up two fingerbreadths from the elbow joint 3. Wrap orthoban around the thumb up to the level of the interphalangeal joint (IPJ) a) First assistant I. Holds the thumb in slight opposition while maintain glass holding position for the index, middle, ring, little fingers and wrist slightly extended II. Cast of the thumb apply slight below IPJ level 4. Soak POP and start wrap the thumb from the wrist from the inside out towards the distal and not exceeding orthoban 5. Wrap the finger palm through the first web space (between thumb and forefinger) 2 times and continue to wrap the thumb till IPJ level 6. Continue to wrap proximally to two fingerbreadth from the elbow joint and do not pass the orthoban tip. Palmar crease and knuckle should be visible 7. At the same time mould the POP, so that outer layer of POP is smooth. Fold the end of the orthoban 8. Repeat wrapping POP with the second roll in the same way 9. Before POP hardens mould POP according to the shape of glasses holding position and at the same time smoothen the POP especially at the fingertips. This way POP will be solid 10. After applying the cast, ensure that the affected limb is cleaned 11. Allow the POP harden after application 12. Following the cast application, apply the arm sling
Reference	1.Clementson, M., Björkman, A., N Thomsen, N. (2020). Acute scaphoid fractures: guidelines for diagnosis and treatment. EFORT Open Reviews, 5(2), 96-103. https://doi.org/10.1302/2058-5241.5.190025 2.Cast selection and non-union rates for acute scaphoid fractures treated conservatively: a systematic review and meta-analysis Siotos, C., Asif, M., Lee, J., Horen, S. R., Seal, S. M., Derman, G. H.,Hasan,

	J. S., Grevious, M. A., Doscher, M. E. (2023). Cast selectionand non-union rates for acute scaphoid fractures treated conservatively: a systematic review and meta-analysis. Journal of Plastic Surgery and Hand Surgery, 57(1-6), 16-21. https://doi.org/10.1080/2000656X.2021.2024439

2.1.5 Bennett's Cast

Objective	To stabilize and immobilize at the fracture site
Indication	Fracture base first metacarpal
Activity	**Work Process**
Perform procedure	1. Assist in firmly holding the limb with the help of an assistant 2. Wrap orthoban past the MCP joint up two fingerbreadth from the elbow joint 3. The assistant pulls the patient's thumb in the abduction and extension position and holds the index, middle and ring fingers of the patient in a hand shake position 4. Soak POP and wrap starting from the wrist in the direction of the wrap from the inside out. Make sure the palms are always open and do not exceed orthoban 5. Wrap the palm of hand and pass through the first web space between the thumb and forefinger 3 times. Continue wrapping around the thumb until the middle of proximal phalanx 6. Continue the proximal bandage up to two fingerbreadth from the elbow joint. Do Not pass the orthoban end 7. At the same time mould the POP so that outer layer's smooth and hard 8. Fold the end of orthoban. Palmar crease and knuckles should be visible 9. Repeat wrapping POP with the second roll in the same way 10. Mold at fracture site to maintained in the abduction and extension position 11. After applying the cast, ensure that the affected limb is cleaned 12. Allow the POP harden after application 13. Following the cast application, apply the arm sling
Reference	1. Bennet EH.Fracture of the Metacarpal Bone. *Dublin Med Sci* J.1882.73:72-75 2. Gaston RG.Fracture of the metacarpal and phalanges.Wolfe SW,Pederson WC,Kozin SH,Cohen MS,end.Green's Operative Hand Surgery.8th ed.Philadelphia: Elsevier;2022.Vol1: 260-324 3. Capo JT,Gottschalk MB.Streubel PN,Rizzo M.Hand fracture and dislocation. Tornetta P III,Ricci WM,Ostrum RF,McQueen MM,McKee MD,Court-Brown CM, eds.Rockwood and Green'sFracture in Adults. 9th ed.Philadelphia:Wolters Kluwer;2020.vol

2.1.6 U-Slab

Objective	Reduction, alignment and immobilize
Indication	Fracture humerus
Activity	**Work Process**
Perform procedure	1. With the help of an assistant hold the limb firmly with the elbow in a 90° flexed 2. Measure length of the slab required from the axilla, along the medial aspect of the arm, around the elbow, up the lateral aspect of the arm and over the ACJ of the shoulder 3. 10 - 12 layers of POP unrolled to the appropriate length measured 4. Put the slab on the orthoban and rub it smooth 5. Apply the U-slab 4 fingerbreadth from axilla along the medial aspect of the arm, around the elbow, up the lateral aspect of the arm and over the ACJ of the shoulder and secured with the crepe bandage and collar and cuff 6. Clean affected limb after applying cast 7. Allow the back slab to harden after application 8. Apply collar and cuff
Reference	1. Acharya, S., Nalge, S. (2019). A study of 40 cases of diaphyseal fracture of shaft of the humerus treated with plate osteosynthesis. International Journal of Orthopaedics, 5(1), 164-169. https://doi.org/10.22271/ortho.2019.v5.i1d.31 2. Camden, P., Nade. S. (2022). Fracture bracing the huimerus. Europe PMC. 23(4), 245-248.https://doi.org/10.1016/s0020-1383(05)80008-7 3. Casting: U-slabs: Mary Drozd and colleagues continue their series on good practice in casting with a review of the application of U-slabs. Emergency Nurse, Oct. 2009

2.1.7 Above Elbow Slab

Objective	Reduction, alignment and immobilize fracture
Indication	1. Fracture radius and ulna 2. Elbow dislocation
Activity	**Work Process**
Perform procedure	1. Assist in holding the limb firmly with the help of an assistant 2. Use POP and measure length of the back slab from metacarpophalangeal joints (MCPJ) to middle of the upper third humerus 3. 10 - 12 layers of POP unrolled to the appropriate length 4. Put the slab on the orthoban and rub it smooth 5. Apply the slab on the dorsal aspect of the forearm and the dorsal aspect of the wrist and secure the back slab with crepe bandage 6. The forearm is held with the elbow in a 90° flexion and the wrist in the functional position 7. The fingers should be free to move fully at the metacarpophalangeal joints 8. Allow the back slab to fully harden after it has been applied 9. After applying the back slab, clean the affected limb and then apply the arm sling
Reference	1. O' Sullivan, L. (2023, August 28). Plaster Of Paris - Basic Techniques EMed. https://emed.ie/Procedures/Backslab.php 2. S. Miles A Practical Guide to Casting (2000) 3. M.A. Prior *et al.* Principles of Casting Journal of Orthopaedic Nursing (1999)

2.1.8 Below Elbow Slab

Objective	Reduction, alignment and immobilize
Indication	Fracture distal end radius ulna, carpal bone and metacarpal
Activity	**Work Process**
Perform procedure	1. Assist in holding the limb firmly with the help of an assistant 2. Use POP and measure the length of the back slab from metacarpophalangeal joints (MCPJ) to two fingerbreadth below the olecranon tip 3. 10 - 12 layers of POP unrolled to the appropriate length measured 4. Put the slab on the orthoban and rub it smooth 5. Apply the slab on the dorsal aspect of the forearm and the wrist and secure the back slab with crepe bandage 6. Wrist in the position of function of 25° dorsiflexion 7. The fingers should be free to move fully at the metacarpophalangeal joints 8. Clean affected limb after applying cast 9. Allow the backslab to harden after application and apply arm sling
Reference	1. Casting: below-elbow back slabs: Mary Drozd and colleagues continue their series on good practice in casting with a review of the application of below-elbow back slabs. Emergency Nurse, Sept. 2009. 2. O' Sullivan, L. (2023, August 28). Plaster Of Paris - Basic Techniques EMed. https://emed.ie/Procedures/Backslab.php

2.1.9 Volar Slab

<table>
<tr><td>Objective</td><td>Reduction, alignment and immobilize to minimize deformity</td></tr>
<tr><td>Indication</td><td>1. Fracture carpal, meta carpal bone, proximal phalanx
2. Extensor tendon cut</td></tr>
<tr><td>Activity</td><td>Work Process</td></tr>
<tr><td>Perform Procedure</td><td>1. Assist in holding the limb firmly with the help of an assistant
2. Use POP and measure propase distal end of the slab from to the proximal third of the forearm
<table>
<tr><th>LEVEL OF INJURY</th><th>END OF SLAB</th></tr>
<tr><td>Carpal Fracture</td><td>MCPJ Level</td></tr>
<tr><td>MetaCarpal Fracture</td><td>PIP Level</td></tr>
<tr><td>Proximal Phalange Fracture</td><td>DIPJ Level</td></tr>
<tr><td>Tendon Cut</td><td>Beyond PIPJ</td></tr>
</table>
3. 10 - 12 layers of POP unrolled to the appropriate length measured
4. Apply back slab to the volar aspect of the patients forearm and hand leaving thumb free. Mold back slab to fit as it sets
5. Place forearm in supination position (wrist dorsiflexed 30°, MCP joints flexed 70° to 90°, IPJs fully extended)
6. Clean affected limb after applying cast
7. Allow the back slab to harden after application and apply arm sling</td></tr>
<tr><td>Reference</td><td>
1. Jawaharlal, N., Ramsingh, V., Bhalaik. V. (2021). An uncommon presentation of fracture-dislocation of the 4th and 5th carpometacarpal joints with volar displacement and its management. Journal of Orthopaedic Case Reports, 11(9), 24.https://doi.org/10.13107%2Fjocr.2021.v11.i09.2400
2. Cohen M, Jupiter J. Fractures of the distal radius. In: Browner B, Jupiter J, Levine A, Trafton P, Krettek C, editors. Skeletal trauma. 4th ed. Philadelphia, PA: Saunders Elsevier; 2008.
3. Means KJ, Graham T. Disorders of the forearm axis. In: Wolfe S, Hotchkiss R, Pederson W, Kozin S, editors. Green's operative hand surgery. 6th ed. Philadelphia, PA: Churchill Livingstone Elsevier; 2010. pp. 837–68.
4. Plint AC, Perry JJ, Correll R, Gaboury I, Lawton L. A randomized, controlled trial of removable splinting versus casting for wrist buckle fractures in children. Pediatrics. 2006;117(3):691–7.
5. Benjamin HJ, Hang BT. Common acute upper extremity injuries in sports. Clin Pediatr Emerg Med. 2007;8(1):15–30.
</td></tr>
</table>

2.1.10 Dorsal Slab

Objective	Reduction, alignment and immobilize to minimize deformity
Indication	Fracture below the wrist / Extensor tendon cut
Activity	**Work Process**
Perform Procedure	1. Assist in holding the limb firmly with the help of an assistant 2. Use POP and measure length of the slab from metacarpophalangeal joints (MCPJ) to the proximal third of the forearm 3. 10 - 12 layers of POP unrolled to the appropriate length measured 4. Apply back slab to the dorsal aspect of the patients forearm and hand leaving thumb free 5. Mold back slab to fit as it sets 6. Place hand in position of safe immobilization and functional position 7. Clean affected limb after applying cast 8. Allow the back slab to harden after application and apply arm sling
Reference	1. Hussain, H., Ahmad, R., Butt, B., George, G., Smith, L. (2019). Is radial slab better than a dorsal slab in maintaining initial reduction in distal radius fractures?, Journal of Orthoplastic Surgery, 3:69-73 2. DeFroda, S. F., Gil, J. A., Bokshan, S., & Waryasz, G. (2015). Upper extremity quad splint: indications and technique. The American Journal of Emergency Medicine, 33(12), 1818-1822. https://doi.org/10.1016/j.ajem.2015.09.027 3. Boyd, A. S., Benjamin, H. J., & Asplund, C. (2009). Splints and casts: indications and methods. American family physician, 80(5), 491-499.

2.1.11 Ulnar Gutter Slab

Objective	Reduction, alignment and immobilize to minimizedeformity
Indication	Fracture 4th and 5th metacarpal bone
Activity	**Work Process**
Perform procedure	1. Assist in holding the limb firmly with the help of an assistant 2. Use POP and measure length of the slab from proximal forearm to slightly beyond the fourth and fifth finger DIP joints 3. 10 - 12 layers of POP unrolled to the appropriate length measured 4. Apply slab on the ulnar side from fourth and fifth fingertips until two fingerbreadth from elbow joint. Wrap with crepe bandage loosely around back slab, leaving thumb free mold back slab to fit as it sets 5. After the slab secured the hand must be functional position 6. Clean affected limb after applying cast 7. Allow the back slab to harden after application and apply arm sling
Reference	1. Kaynak, G., Botanlioglu, H., Caliskan, M. et al. (2019). Comparison of functional metacarpal splint and ulnar gutter splint in the treatment of fifth metacarpal neck fractures: a prospective comparative study. BMC Musculoskelet Disord, 20, 169-179. https://doi.org/10.1186/s12891-019-2556-6 2. Lewis, M. (2022, September 17). How to apply an ulnar gutter splint. MSD Manual Professional Version. https://www.msdmanuals.com/professional/injuries-poisoning/how-to-splint-or-immobilize-an-upper-limb/how-to-apply-an-ulnar-gutter-splint 3. Washmuth, D. (2022, February 2). Ulnar, radial gutter & thumb spica casts. Study.com. https://study.com/academy/lesson/hand-finger-casts-ulnar-gutter-radial-gutter-thumb-spica.html#:~:text=Ulnar%20gutter%20casts%20are%20used,and%20most%20of%20the%20forearm.

PERFORM PROCEDURE APPLICATION OF PLASTER CAST

2.2 : LOWER LIMBS

2.2.1 Above knee cast

Objective	To immobilize and maintain alignment
Indication	Fracture of tibia and fibula
Activity	**Work Process**
Perform procedure	1. Place patient in supine position 2. Wrap the orthoban from metatarsalphalanges joint to upper third thigh 3. Place padding on the bony prominences, including the medial and lateral malleolus, tibial tuberosity, and head of the fibula 4. Apply the POP (first layer) from the tip of the foot to knee level (not covering the popliteal fossa) and do not exceed the orthoban on the tip of toe 5. Maintain the lower limb alignment (patient position of second toe, midof patella and ASIS). Knee flexion range 15° to 30° 6. Fold the ends of the orthoban at the ends of the feet 7. Apply POP to the upper third thigh 8. Ensure both ends of the plaster are smoothed 9. After applying the cast, ensure that the affected limb is cleaned 10. Allow the back slab to harden after application
Reference	1. Denq, W. (2020). Tibia and Fibula. Sports-related Fractures, Dislocations and Trauma: Advanced On-and Off-field Management, 421-436. https://doi.org/10.1007/978-3-030-36790-9_25 2. Marzi, I., Frank, J., & Rose, S. (2022). Tibia and Fibula. In Pediatric Skeletal Trauma: A Practical Guide Cham: Springer International Publishing. 405-428. https://doi.org/10.1007/978-3-030-93685-3_14

2.2.2 Below Knee Cast

Objective	To immobilize and maintain alignment
Indication	1. Fracture of lateral /medial malleolus/ tarsal / metatarsal 2. Ankle dislocation and subtalar dislocation, tarsometatarsal dislocation 3. Soft tissue injury of ankle joint
Activity	**Work Process**
Perform procedure	1. Position the patient in a supine position 2. Wrap the orthoban from the knee joint to the metatarsophalangeal joint 3. Place padding on both medial malleoli 4. Set the ankle joint in a plantigrade position 5. Apply POP from the distal tibial tuberosity, extending to the metatarsophalangeal joint 6. Ensure that the toes are not pinched 7. Clean the affected limb after applying the cast 8. Allow the back slab to harden after application
Reference	1. Souder, C. D., & Vaughan, C. T. (2021). Below-knee cast immobilization for distal tibial physeal fractures. The Journal of Foot and Ankle Surgery, 60(3), 529-534. https://doi.org/10.1053/j.jfas.2019.11.010 2. Lu, P., Liao, Z., Zeng, Q., Chen, H., Huang, W., Liu, Z., ... & Huang, G. (2021). Customized three-dimensional-printed orthopedic close contact casts for the treatment of stable ankle fractures: finite element analysis and a pilot study. ACS omega, 6(4), 3418-3426. https://doi.org/10.1021/acsomega.0c06031 3. Court-Brown CM. Fractures of the tibia and fibula. In: Rockwood CA, Green DP, Buchholz RW, editors. Rockwood and Green's fractures in adults. 6th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2006. pp. 2079–146.

2.2.3 Cylinder Cast

Objective	To immobilize and maintain alignment
Indication	Patella fracture, cartilage or ligament injury of the knee joint
Activity	**Work Process**
Perform procedure	1. Position the patient in a supine position 2. With the help of an assistant, carefully hold the affected limb 3. Maintain alignment of the lower limb 4. Apply orthoban to the mid-thigh, knee joint, and both malleoli 5. Apply plaster of Paris (POP) from distal to proximal (2 fingerbreadths from the malleolus to the mid-thigh) 6. Mold with the palm over the medial and lateral aspects of the femoral condyles 7. Clean the affected limb after applying the cast 8. Allow the POP to harden after application
Reference	1. Hargett, D. I., Sanderson, B. R., Little, M. (2021). Patella fractures: approach to treatment.JAAOS-Journal of the AmericanAcademy of Orthopaedic Surgeons, 29(6), 244-253.https://doi.org/10.5435/JAAOS-D-20-00591 2. Vaziri, A. S., Shayan-Moghadam, R., Tahmasebi, M. N., Tahami,M., Vosoughi, F. (2019). Comminuted patellar fracture: a summary of the latest updates. Journal of Orthopedic and SpineTrauma, 5(4), 99-102. https://doi.org/10.22271/ortho.2019.v5.i1d.31

2.2.4 Patella Tendon Bearing (PTB) Cast

Objective	To immobilize and maintain alignment
Indication	1. Fracture midshaft/distal third tibia with union 2. Undisplaced stable fracture of tibia
Activity	**Work Process**
Perform procedure	1. Place the patient in a supine position 2. With the help of an assistant, firmly hold the limb 3. Apply padding to bony prominences, including both condyles of the tibia, head of the fibula, and both malleoli 4. Position the knee in 30º to 40º of flexion 5. Reinforce the slab on the soles of the feet with a thickness of 8 to 10 layers 6. Apply plaster of Paris (POP) from proximal to the metatarsophalangeal joint (MTPJ) and progress upward, covering around the mid-patella, medial and lateral condyles of the femur (exposing the popliteal fossa) 7. Place a slab at the level of the tibial tubercle until the mid-patella is covered. Set the ankle joint in a plantigrade position and maintain the alignment of the lower limb 8. Ensure the knee joint can extend 9. Clean the affected limb after applying the cast 10. Allow the plaster of Paris (POP) to harden after application
Reference	1. Rowley, D. I. (2000). The effect of the patellar tendon-bearing cast on loading. The Journal of Bone and Joint Surgery, 82(6), 930-930. 2. Petermann, J., Ishaque, B., Ziring, E., & Gotzen, L. (2001). External patellotibial transfixation: indications, operative technique and outcome. The Knee, 8(2), 111-121. https://doi.org/10.1016/S0968-0160(00)00064-8

2.2.5 Above Knee Slab

Objective	To immobilize and maintain alignment
Indication	Fracture of tibia and fibula
Activity	**Work Process**
Perform procedure	1. Place the patient in a supine position 2. With the help of an assistant, hold the limb firmly 3. Use plaster of Paris (POP) and measure the length of the slab from the metatarsophalangeal joint to the upper third of the thigh 4. Unroll 14 to 16 layers of POP to the measured length 5. Place the slab on the orthoban and rub it smooth 6. Apply the slab from the metatarsophalangeal joint to the upper third of the femur, securing the back slab with a crepe bandage 7. Maintain the alignment of the lower limb, ensuring the patient's position aligns with the second toe, mid-patella, and ASIS. Keep the knee flexion range between 15º to 30º 8. Clean the affected limb after applying the cast 9. Allow the plaster of Paris (POP) to harden after application
Reference	1. O' Sullivan, L. (2023, August 28). Plaster Of Paris - Basic Techniques EMed. https://emed.ie/Procedures/Backslab.php

2.2.6 Below Knee Slab

Objective	To immobilize and maintain alignment
Indication	1. Closed stable/non displaced fracture 2. Fracture below ankle 3. Medial/lateral malleolus 4. Ligamentous injury around ankle joint
Activity	**Work Process**
Perform procedure	1. Place the patient in a supine position 2. With the help of an assistant, hold the limb firmly 3. Use plaster of Paris (POP) and measure the length of the slab from just below the knee extending just below the toes 4. Unroll 14 to 16 layers of POP to the appropriate measured length 5. Place the slab on the orthoban and rub it smooth 6. Set the ankle joint in a plantigrade position 7. Apply the slab from just below the knee, extending just below the toes, and secure it with a crepe bandage 8. Clean the affected limb after applying the cast 9. Allow the plaster of Paris (POP) to harden after application
Reference	1. Casting: below-knee back slabs: Mary Drozd and colleagues end their series on good practice in casting with a review of the application of below-knee back slabs. Emergency Nurse, Nov. 2009.

2.2.7 Cylinder Slab

Objective	To immobilize and maintain alignment
Indication	Patella fracture, cartilage or ligament injury of the knee joint
Activity	**Work Process**
Perform procedure	1. Patient in supine position 2. With the help of an assistant, hold the affected limb carefully 3. Maintain alignment of the lower limb 4. Apply orthoban to the mid-thigh, knee joint, and both malleoli 5. Apply the slab from distal to proximal (2 finger breadth from malleoli to mid-thigh) 6. Unroll 14 to 16 layers of POP to the appropriate length 7. Place the slab on the orthoban and smooth it 8. Apply the slab on the posterior aspect from mid-femur to the posterior aspect of the tibial malleolus, securing the back slab with a crepe bandage 9. Clean the affected limb after applying the cast 10. Allow the POP to harden after application
Reference	1. Van Gemert, J.P., de Vree, L.M., Hessels, R. et al. (2012). Patellar dislocation: cylinder cast, splint or brace? An evidence-based review of the literature. International Journal Emergency Medicine,5(45), 1-5. https://doi.org/10.1186/1865-1380-5-45

SPECIAL CAST

2.2.8 Body Cast

Objective	To stabilize and immobilize
Indication	1. Stable thoracolumbar fracture 2. Post operative spine
Activity	**Work Process**
Perform procedure	1. Position Patient: 1.1. Patient stands with two supportive beams 1.2. Patient sits on a chair (for patients who cannot stand) 1.3. Prone position (for patients who cannot stand or sit) 2. Application: 2.1. Apply soft stockinette from the axilla point to the groin 2.2. Place padding at bone prominences (ASIS, iliac crest) to prevent pressure 2.3. Fold a roll of orthoban and place it between the stockinette and the body from the sternum to the abdomen 2.4. Wrap the body with the orthoban starting from the axilla to the groin with neat and compact pressure 2.5. Prepare four slabs with POP; the slabs will be placed on the left and right sides and the lumbar region of the back 2.6. Apply POP starting from below the axillary to the top of the iliac crest 2.7. Place the four POP slabs prepared earlier on the left and right sides and the lumbar region of the back. Continue applying POP until all the slabs are covered 2.8. Fold the orthoban over the axillary and below the iliac crest 2.9. Trimming of POP should be done with the patient in an upright position to avoid pressure sores at the iliac crest and axillary 2.10. Pull out the orthoban padding placed between the stockinette and the body to release pressure and prevent cast syndrome 3. Clean affected limb after applying cast

Reference	1. Rava, A., Fusini, F., Cinnella, P., Massè, A., & Girardo, M. (2019). Is cast an option in the treatment of thoracolumbar vertebral fractures? Journal of Craniovertebral Junction & Spine, 10(1), 51-56. https://doi.org/10.4103%2Fjcvjs.JCVJS_8_19 2. Warnick, E., Amin, S., Lendner, M., Butler, J. S., & Vaccaro, A. R. (2019). Thoracolumbar Spine Trauma. Fundamentals of Neurosurgery: A Guide for Clinicians and Medical Students, 95-109. https://doi.org/10.1007/978-3-030-17649-5_7

2.2.9 Posterior Tibial Support Cast

Objective	To mechanically support and protect the proximal part of tibia from posterior translation PCL surgery
Indication	1. Post-Op PCL reconstruction surgery 2. Acute PCL partial tear
Activity	**Work Process**
Perform procedure	1. Place patient in supine position 2. Minimum two person involved in the procedure 3. Assistant to hold and position the limb carefully 4. Prepare posterior padding with orthoban 5. Hang the knee to translate proximal tibial anteriorly 6. Maintain position 15° to 30° knee flexion 7. Place posterior padding at proximal tibial 8. Place marking on cast for open window (wound management) if necessary 9. Wrap the orthoban from metatarsal phalanges joint to upper third thigh 10. Placed padding on bony prominent (medial malleolus, tibial tuberosity and head of fibula) 11. Apply the POP (first layer) from the tip of the foot to knee level (not covering the popliteal fossa) and do not exceed the orthoban on thetip of toe 12. Maintain the lower limb alignment (patient position of second toe, mid of patella and ASIS. Knee flexion range 15° to 30° 13. Fold the ends of the orthoban at the ends of the feet 14. Apply POP to the upper third thigh 15. Smoothen both end of the plaster 16. Clean affected limb after applying cast 17. Allow the back slab to harden after application
Reference	1. Jung, B. Y., Tae, K. S., Lee, Y. S., Jung, J. H., Nam, H. C., & Park, S.J. (2008). Active non-operative treatment of acute isolated posterior cruciate ligament injury with cylinder cast immobilization. Knee Surgery, Sports Traumatology, Arthroscopy, 31(10), 729-733.\

2.2.10 Unilateral/Bilateral Hip Spica (Paediatric)

Objective	To maintain and immobilize hip joint, pelvis, femur and to correct hip deformities
Indication	1. Fracture femur 2. Developmental dysplasia of hip 3. Fracture dislocation femur and hip joint 4. Slipped femoral epiphysis 5. Infection – osteomyelitis hip joint
Activity	**Work Process**
Perform procedure	1. Equipment for Hip spica procedure 1.1 Hip spica table 1.2 Orthoban 1.3 POP based on patient size 1.4 Padding 1.5 Reinforce with slabs using POP create four slabs 2. Position patient lie on hip spica table by position 2.1 Hip flexion 15° to 20° 2.2 Knee flexion 20° to 30° 2.3 Hip abduction 15° to 20° 2.4 Gluteal and heel must be align 3. Put a hip spica box at the thoracic part 4. Apply stockinette at abdomen and the affected leg 5. Padding to be inserted in between the abdomen and the stockinette for breathing comfort for the patient 6. Orthoban to be apply starting approximately 2cm to 3cm above umbilical until the malleolus 7. Padding to be apply over bony prominent area 8. POP to be apply starting from the abdomen until supracondylar femur 9. First slab to be apply anterosuperior to posterior inferior across the hip joint 10. Second slab to be apply on the in posterior superior to anterior inferior across the hip joint

	11. Third slab will be apply lateral side starting from iliac crest until midthigh 12. Once completed the cast above knee continue apply POP from the midthigh until 1cm to 2 cm above malleolus 13. Make sure genital and rectal region to be exposed and no cast covering the area 14. Clean affected limb after applying cast
Reference	1. Pisecky, L., Großbötzl, G., Gahleitner, M., Haas, C., Gotterbarm, T., & Klotz, M. C. (2021). Results after spica cast immobilization following hip reconstruction in 95 cases: is there a need for alternative techniques?. Archives of Orthopaedic and Trauma Surgery, 1-9. https://doi.org/10.1007/s00402-020-03733-8 2. Flynn, J. M., Garner, M. R., Jones, K. J., D'Italia, J., Davidson, R. S., Ganley, T. J., ... & Wells, L. (2011). The treatment of low-energy femoral shaft fractures: a prospective study comparing the "walking spica" with the traditional spica cast. JBJS, 93(23), 2196-2202. https://doi.org/10.2106/JBJS.J.01165 3. Cassinelli, E. H., Young, B., Vogt, M., Pierce, M. C., & Deeney, V.F. (2005). Spica cast application in the emergency room for select pediatric femur fractures. Journal of orthopaedic trauma, 19(10),709 - 716. https*://doi.org/10.1097/01.bot.0000184146.82824.35*

2.2.11 Congenital Talepes Equinosvarus (CTEV) Cast (Paediatric)

Objective	To put the foot back into a normal position and be pain-free throughout life
Indication	Talipes equinovarus deformity
Activity	**Work Process**
Perform procedure	1. The component of the clubfoot deformity must be corrected in the sequence Cavus Adductus, Varus Equinus by 6 weeks 2. Hold the leg with proper way when doing Ponseti manipulation by using the left thumb on the lateral head of talus with the left index and middle fingers holding the medial malleolus but not touching the heel (make sure the calcaneus not be touched during manipulation as its position corrects naturally as the forefoot is brought into abduction) **2.1 Cavus correction (1st week)** Cavus is corrected by supinating the forefoot in proper alignment with the hindfoot, with aim being to position the forefoot to create a normal looking arch of the foot **2.2 Adductus correction (2nd – 3rd week)** Corrected by gradually abduction the midfoot, with movement occurring in the plane of the sole of foot. The entire foot can be gently and gradually abducted under the talus, which is secured against rotation in the ankle joint by applying counter pressure with the thumb against the head of the talus **2.3 Varus correction (4th-5th week)** Heel varus will automatically be corrected when the entire foot is fully abducted **2.4 Equinus correction (6th week)** Corrected by dorsiflexing the foot. A little correction of equinus occurs naturally as the foot is abducted but no attempt should be made to actively dorsiflex until: 2.4.1 The talus head is covered, usually the midfoot contracture score is zero 2.4.2 The foot abducted to 50° to 70° 2.4.3 The heel is in valgus or at least neutral ***Refer Diagram 1: Ponseti Cast** 3. Clean affected limb after applying cast

Reference	1. Das, C., Das, P. P., & Gupta, N. (2023). Ponseti Technique for CTEV: Our Experience at TMCH. International Journal of Orthopaedic Surgery,31(1),11-16. https://doi.org/10.4103/ijors.ijors_10_22

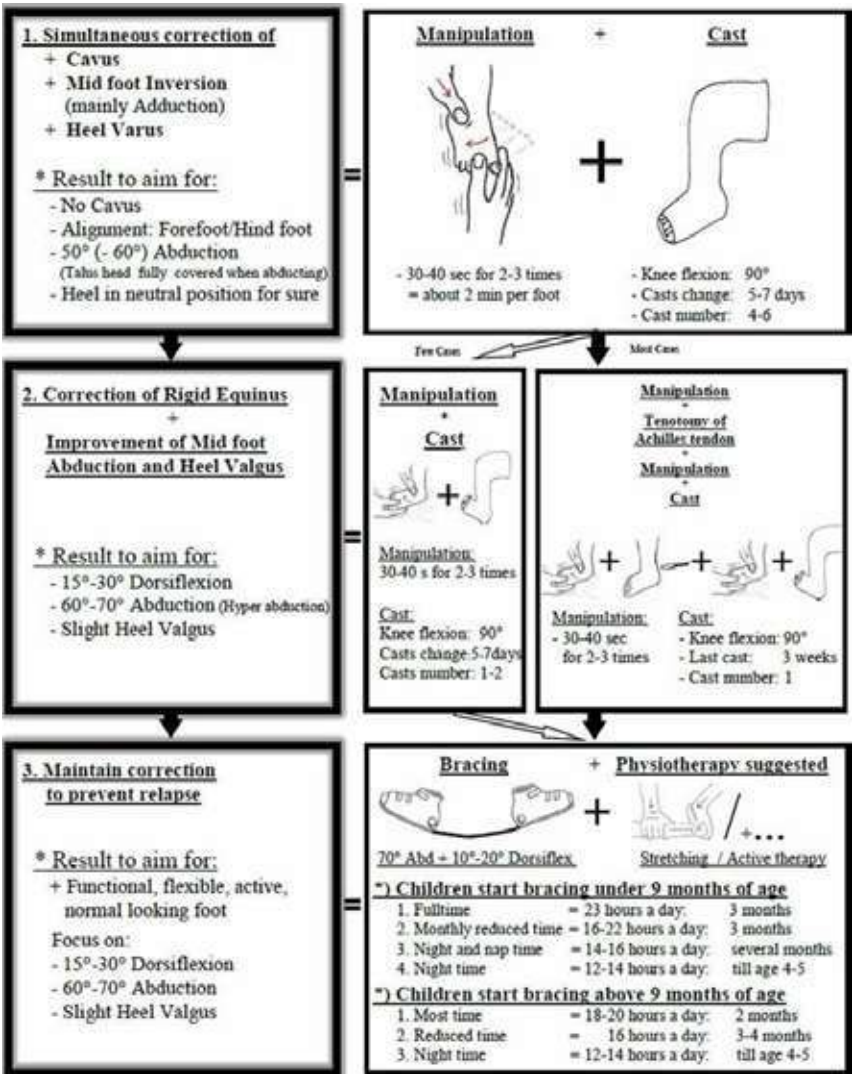


Diagram 1: Ponseti Cast.

CHAPTER 3 : APPLICATION GENERAL PROCEDURE

	11. Third slab will be apply lateral side starting from iliac crest until midthigh 12. Once completed the cast above knee continue apply POP from the midthigh until 1cm to 2 cm above malleolus 13. Make sure genital and rectal region to be exposed and no cast covering the area 14. Clean affected limb after applying cast
Reference	1. Pisecky, L., Großbötzl, G., Gahleitner, M., Haas, C., Gotterbarm, T., & Klotz, M. C. (2021). Results after spica cast immobilization following hip reconstruction in 95 cases: is there a need for alternative techniques?. Archives of Orthopaedic and Trauma Surgery, 1-9. https://doi.org/10.1007/s00402-020-03733-8 2. Flynn, J. M., Garner, M. R., Jones, K. J., D'Italia, J., Davidson, R. S., Ganley, T. J., ... & Wells, L. (2011). The treatment of low-energy femoral shaft fractures: a prospective study comparing the "walking spica" with the traditional spica cast. JBJS, 93(23), 2196-2202. https://doi.org/10.2106/JBJS.J.01165 3. Cassinelli, E. H., Young, B., Vogt, M., Pierce, M. C., & Deeney, V.F. (2005). Spica cast application in the emergency room for select pediatric femur fractures. Journal of orthopaedic trauma, 19(10),709 - 716. https*://doi.org/10.1097/01.bot.0000184146.82824.35*

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Perform procedure	1. The component of the clubfoot deformity must be corrected in the sequence Cavus Adductus, Varus Equinus by 6 weeks 2. Hold the leg with proper way when doing Ponseti manipulation by using the left thumb on the lateral head of talus with the left index and middle fingers holding the medial malleolus but not touching the heel (make sure the calcaneus not be touched during manipulation as its position corrects naturally as the forefoot is brought into abduction) **2.1 Cavus correction (1st week)** Cavus is corrected by supinating the forefoot in proper alignment with the hindfoot, with aim being to position the forefoot to create a normal looking arch of the foot **2.2 Adductus correction (2nd – 3rd week)** Corrected by gradually abduction the midfoot, with movement occurring in the plane of the sole of foot. The entire foot can be gently and gradually abducted under the talus, which is secured against rotation in the ankle joint by applying counter pressure with the thumb against the head of the talus **2.3 Varus correction (4th-5th week)** Heel varus will automatically be corrected when the entire foot is fully abducted **2.4 Equinus correction (6th week)** Corrected by dorsiflexing the foot. A little correction of equinus occurs naturally as the foot is abducted but no attempt should be made to actively dorsiflex until: 2.4.1 The talus head is covered, usually the midfoot contracture score is zero 2.4.2 The foot abducted to 50° to 70° 2.4.3 The heel is in valgus or at least neutral ***Refer Diagram 1: Ponseti Cast** 3. Clean affected limb after applying cast

3. Prepare equipments and patient	1. Ensure POP trolley was fully equipment and well function 2. Correct patient 3. Order slip 4. Explain to patient/relative 5. Confirm with patient the affected limb 6. Place patient in a comfortable position 7. Place the linen protector under the injured limb 8. With help of an assistant, hold and position the limb as required		1. POP trolley **Refer Appendix 1** 2. Limb support 3. Spacer block 4. Goniometer 5. Plaster 6. Marker 7. Personal Protection Equipment 8. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO. 01/17 MOH
4. Perform procedure	1. Review the X-ray 2. Draw lines along the longitudinal axis of the proximal and distal fragment 3. Measure the angle of the deformity 4. Mark and cut the POP at the level of the fracture. Use the "in and out" technique according to the marked line without dragging or applying excessive pressure (to prevent the skin from being injured) 5. Correct the angulation, insert the wedging block according to the angle of deformity 6. Reinforce the wedge with padding and plaster	1. Used goniometer 2. Cut ¾ of the circumferance of POP 3. Angulation should be corrected	1. X-ray (Pre & post reduction) - AP view - Lateral view 2. Personal Protection Equipment

5. Observation	1. Observe, record neurovascular status 2. Pain score 3. Refer to doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
6. Post procedure advice care	1. Wound care 2. Encourage movement of extremities 3. Care of cast 4. Advise patient to come to Orthopaedic Out-patient clinic/ Emergency Department immediately if develops any: 4.1 Tightness 4.2 Swelling 4.3 Severe pain 4.4 Numbness 4.5 Monitor for any change in color of extremities 4.6 Fever 4.7 Foul smell		1. Health Education: LPP.ORTHO.02/17 (Orthopedic Advice Slip)
7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. Jacobson, N. A., & Lee, C. L. (2014). Some Historical Treatments should not be Forgotten: A Review of Cast Wedging and A Trick to Normalize Non-Standardized Digital X-rays. *Journal of Orthopaedic Case Reports*, 33 - 37. 2. Samora, J. B., Klingele, K. E., Beebe, A. C., Kean, J. R., Klamar, J., Beran, M. C... Samora, W. P. (2014). Is There Still a Place for Cast Wedging in Pediatric Forearm Fractures? *Journal of Pediatric Orthopaedics*, 246-252. 3. Wells, L., Avery, A. L., Hosalkar, H. H., Friedman, J. E., & Davidson, R.S. (2010). Cast Wedging: A "Forgotten" Yet Predictable Method for Correcting Fracture Deformity. *University of Pennsylvania Orthopaedic Journal*, 113 - 116.		

3.2. Splitting of Cast.

Objective	Reduce tightness of plaster cast		
Indication	Swelling at the affected limb		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read instruction 2. Register patient		1. Patient record system 2. Order slip
2. Assessment/ Examination	1. Confirm fracture/ affected limb/site/side 2. Check for integrity of plaster cast 3. Check Neurovascular status, movement of the limb 4. Consult doctor if any abnormalities found and patient might be not fit for the procedure 5. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO.01/ 17 MOH 3. Pain score scale
3. Prepare equipment and patient	1. Ensure POP trolley was fully equipment and well function 2. Confirm patient 3. Order slip 4. Explain to patient/relative 5. Confirm with patient the affected limb 6. Position the patient comfortably 7. Place linen protector under the injured limb 8. With help of an assistant, hold and position the limb as required		1. POP trolley **REFER APPENDIX 1** 2. Plaster 3. Marker 4. Personal Protection Equipment

4. Perform procedure	1. Identify mark bony prominences 2. Mark the cutting line along the longitudinal axis on the dorsal, medial, or lateral side of the cast, avoiding bony prominences or as per the provided instructions 3. Complete cast removal 4. Use the “in and out” for precision, following the marked line without dragging or applying excessive pressure (to prevent the skin from being injured) 5. Use spreader to easy open the split along the length of the cast 6. Use the scissor to cut through any remaining plaster, padding and stockinette 7. The skin should be visible all the way along the split with nothing obstructing the two sides of the gap 8. Apply a crepe bandage gently		1. Personal Protection Equipment
5. Observation	1. Observe, record neurovascular status 2. Pain score 3. Refer to doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
6. Post procedure advice care	1. Wound care 2. Encourage movement of extremities 3. Care of splint 4. Advise patient to come to Orthopaedic Out-patient clinic/Emergency Department immediately if develops any:		1. Health Education: LPP.ORTHO.02 /17(Orthopedic Advice Slip)

	4.1. Swelling 4.2. Severe pain 4.3. Numbness 4.4. Monitor for any change in color of extremities 4.5. Fever 4.6. Foul smell		
7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. (n.d.). Retrieved from theplasterroom: https://theplasterroom.co.uk/basics/bivalving-and-removal 2. A.S.E. Younger 1, P. C. (1990). Backslabs and plaster casts: whichwill best accommodate increasing intracompartmental pressures? *Injury*, 179-181. 3. Bingold, A. (1981). On splitting plasters: a useful analogy. *Injury*. 4. Dominic M. Nielsen, D. M. (2005). Where to split plaster casts. *Injury*,588-589. 5. *splitting cast*. (n.d.). Retrieved from theplasterroom: https://theplasterroom.co.uk/basics/splitting-casts		

3.3. Bivalve Cast

Objective	1. Prevent complication of cast 2. To inspect the skin condition 3. For wound management 4. To convert from cast to back slab		
Indication	1. To reduce swelling on the involve limb 2. Preparation for implant surgery		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read instruction 2. Register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Confirm fracture/ affected limb/site/side 2. Check for integrity of plaster cast 3. Check for rotational angulation 4. Check Neurovascular status, movement of the limb 5. Pain score 6. Consult doctor if any abnormalities found and patient might be not fit for the procedure 7. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Pain score scale
3. Prepare equipments and patient	1. Confirm patient 2. Order slip 3. Explain to patient/relative 4. Confirm with patient the affected limb 5. Position the patient comfortably 6. Place linen protector		1. POP trolley **REFER APPENDIX 1** 2. Plaster 3. Marker 4. Personal Protection Equipment

	under the injured limb 7. With help of an assistant,hold and position the limb as required		
4. Perform procedure	1. Locate and identify bony prominences 2. Mark the cutting line longitudinal axis at medial and lateral side of cast 3. Cut the cast at medial and lateral side from distal to proximal or vice versa 4. Use a spreader to ease open the split along the length of the cast 5. Use the scissors to cut through any remaining plaster, padding and stockinett 6. Apply the crepe bandage gently		1. Personal Protection Equipment
5. Observation	1. Observe, record neurovascular status 2. Pain Score 3. Refer to doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
6. Post procedure advice care	1. Wound care 2. Encourage movement of extremities 3. Care of splint 4. Advise patient to come to Orthopaedic Outpatient clinic/ Emergency Department immediately if develops any: 4.1. Swelling 4.2. Severe pain 4.3. Numbness 4.4. Monitor for any		1. Health Education: LPP.ORTHO.02/17 (Orthopedic Advice Slip)

	change in color of extremities 4.5. Fever 4.6. Foul smell		
7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. bivalving and removal. (n.d.). Retrieved from theplasterroom: https://theplasterroom.co.uk/basics/ bivalving-and-removal 2. SINGH, D. A. (31 July, 2019). What is Bivalved Cast? Retrieved from Bone and Spine: https://boneandspine.com/what-is-bivalve-cast		

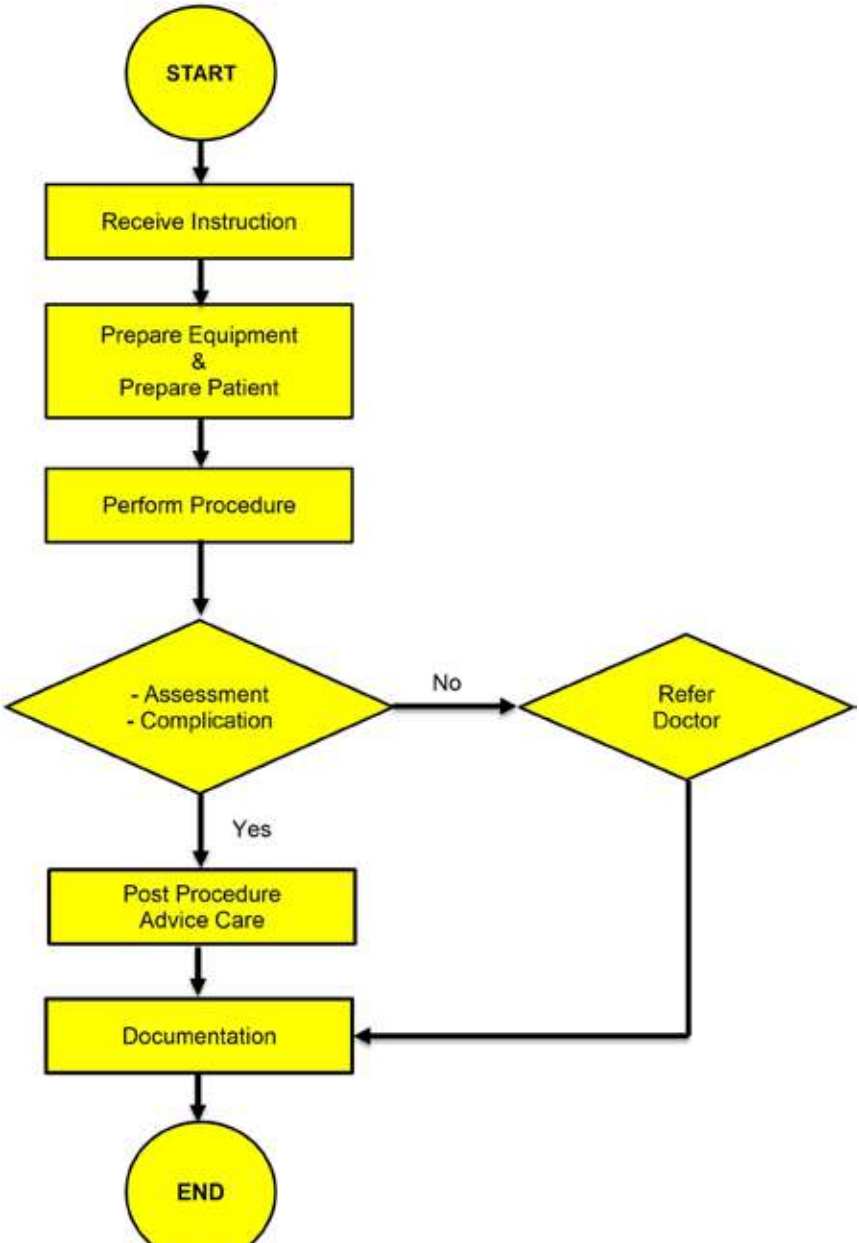
3.4. Open Window Cast

Objective	Management of wound care		
Indication	For wound management		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instruction by doctor and Registration	1. Read instruction and register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Confirm fracture/ affected limb/site/side 2. Check for integrity of plaster cast 3. Check for rotational angulation 4. Check Neurovascular status, movement of the limb 5. Pain score 6. Consult doctor if any abnormalities found and patient might be not fit for the procedure 7. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO.01/17 MOH 3. Pain score scale
3. Prepare equipments	1. Explain to patient/relatives about the procedure 2. Confirm with patient the affected limb 3. Position the patient comfortably 3. Place linen protector under the injured limb 4. With help of an assistant,hold and position the limbas required		1. POP trolley **REFER APPENDIX 1** 2. Plaster 3. Marker 4. Dressing trolley 5. Dressing set 6. Personal Protection Equipment

5. Perform procedure	1. Confirm the marking area 2. Cut the cast and orthoban over the marking area *The removed section should not exceed 50% of the circumference of the cast 3. Use the “in and out” technique according to the marked line without dragging or applying excessive pressure (to prevent the skin from being injured) 4. The wound must be fully exposed from the plaster cast 5. The removed section may be retained as a lid cover	1. Manual for Sterile Preparation KKM Second Edition 2021	1. Personal Protection Equipment
5. Observation	1. Observe and record circulation 2. Take necessary action if complication arise 3. Skin integrity		1. Circulation chart
6. Post procedure advice care	1. Wound care 2. Encourage movement of extremities 3. Care of splint 4. Advise patient to come to Orthopaedic Outpatient clinic/ Emergency Department immediately if develops any: 4.1. Swelling 4.2. Severe pain 4.3. Numbness 4.4. Change in colour of extremity		1. Health Education: LPP.ORTHO. 02/17(Orthopedic Advice Slip)

	4.5. Fever 4.6. Foul smell		
7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. Nimesh Patel a, L. W. (2017). Does cutting a plaster window weaken its strength? *Injury*, 648-652. 2. P.J Roberts, D. K.-J. (1999). A novel method of incorporating windowsin a cast. *Injury*, 135-136. 3. *windows*. (n.d.). Retrieved from theplasterroom: https://theplasterroom.co.uk/basics/ *windows*		

FLOWCHART REMOVAL OF PLASTER CAST PROCEDURE



CHAPTER 4: WORK PROCESS REMOVAL OF CAST PROCEDURE

Objective	Removal of plaster cast		
Indication	1. Assess fracture union 2. Cast nor required 3. Cast not functioning		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read instruction by doctor and register patient		1. Patient record system 2. Order slip
2. Prepare equipments and prepare patient	1. Ensure POP trolley was fully equipment and well function 2. Explain to patient/relatives about the procedure 3. Confirm with patient the affected side 4. Position the patient comfortably 5. Place linen protector 6. With help of an assistant, hold and position the limb if required		1. POP trolley **REFER APPENDIX 1** 2. Personal Protection Equipment
3. Perform procedure	1. Draw lines along the longitudinal axis on the medial and lateral sides 2. Cut Plaster of Paris (POP) and Orthoban according to the demarcated lines 3. Utilize the 'in and out' technique according to the marked line, avoiding dragging or applying excessive pressure to prevent injury to the skin 4. Use the spreader to assist in the removal of		

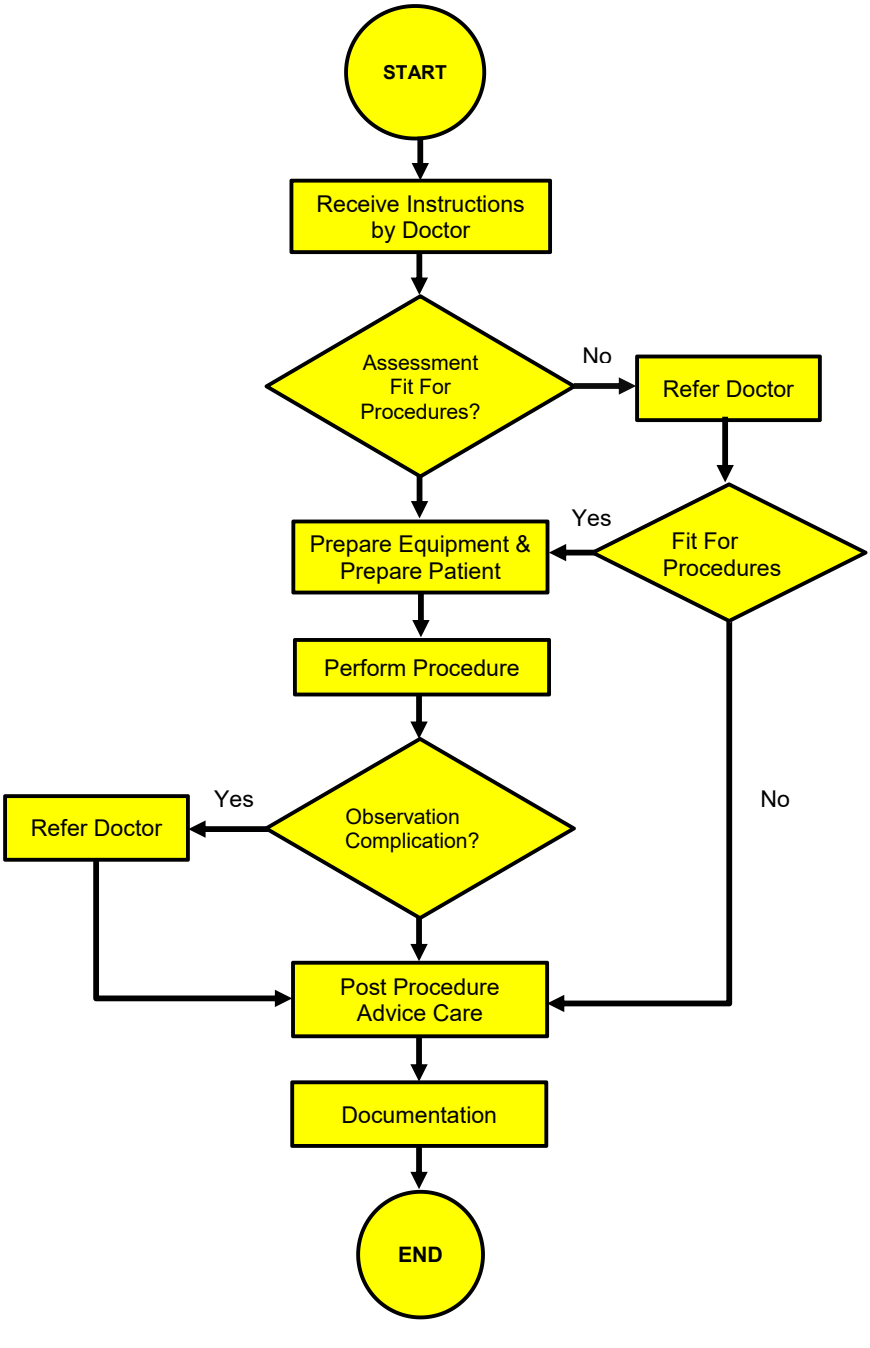
	the cast 5. Cut the stockinette / Orthoban 6. Clean the patient before sending them back		
4. Assessment	1. Observe and record circulation 2. Pain score 3. Skin integrity 4. Refer to doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
5. Post procedure advice care	1. Care of the wound 2. Encourage movement of extremities 3. Advise patient to come to Orthopaedic Out-patient clinic/ Emergency Department immediately if develops any: 3.1. Swelling 3.2. Severe pain 3.3. Numbness 3.4. Monitor for any change in color of extremities 3.5. Fever 3.6. Foul smell		1. Health Education: LPP.ORTHO. 02/17(Orthopedic Advice Slip)
6. Documentation	1. Document the procedure		1. Procedure Record System
7. Reference	1. Panduan Praktikal Pemasangan Plaster Kast (KKM) Edisi ke 2(2012) 2. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006) 3. *Pain The 5th Vital Sign third Edition* 4. *Policies & Procedures on Infection Prevention and Control* (KKM) 5. *AO Trauma Casts, Splints, And Support Bandages – Non operative Treatment and Periopertive Protection.* 6. James Y,McCue.(2022,Sept) *How to remove a cast*. MSD Manual Professional Version. msdmanuals.com		

CHAPTER 5 : APPLICATION OF SPLINTING

5.1 Aluminum Malleable Padded Splint

5.2 Buddy Splint

***All procedure in this chapter need more than 1 healthcare provider to perform**


START
Receive Instructions by Doctor
Assessment Fit For Procedures?
No
Refer Doctor
Fit For Procedures
Yes
Prepare Equipment & Prepare Patient
Perform Procedure
Observation Complication?
Yes
Refer Doctor
No
Post Procedure Advice Care
Documentation
END

CHAPTER 5 : WORK PROCESS APPLICATION OF SPLINTING

5.1 Application of Aluminum Malleable Padded Splint

Objective	Immobilize fracture or dislocation		
Indication	Closed fracture/Dislocation of phalanx		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read instruction 2. Register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Review the X-ray 2. Confirm the affected site 3. Assess the local condition 4. Check condition of wound if any 4.1. Swollen 4.2. Bruises 4.3. Blister 4.4. Tense 4.5. Reduced sensation 4.6. Reduced circulation 5. Pain score 6. Refer doctor if any abnormalities found and patient might be not fit for the procedure 7. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO.01/17 MOH 3. Pain score scale

3. Prepare equipment and patient	1. Prepare equipment and medications 2. Explain to patient/relative 3. Confirm with patient the affected limb 4. Position the patient comfortably 5. Place the linen protector under the injured limb		1. Adhesive plaster 2. Scissors 3. Personal Protection Equipment 4. Splints 5. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO.01/17
4. Perform procedure	1. With the assistance of an assistant, carefully hold the affected limb 2. Stabilize the fracture 3. Apply a malleable splint to the affected limb 4. Secure with plaster or bandage 5. Clean the affected limb 6. Check the X-ray (pre- and post-reduction)		1. X-ray film(Pre & post reduction) - AP view - Lateral view 2. Personal Protection Equipment
5. Post procedure advice care	1. Wound care 2. Encourage movement ofextremities 3. Care of splint 4. Advise patient to come to Orthopaedic Out-patient clinic/ Emergency Department immediately if develops any: 4.1. Swelling 4.2. Severe pain 4.3. Numbness 4.4. Monitor for any change in color of extremities 4.5. Fever		1. Health Education: LPP.ORTHO.02/17(Orthopedic Advice Slip)

	4.2 Foul smell		
6. Documentation	1. Document the procedure		1. Procedure Record System
7. Reference	1. Lewis, M. (2022, Sept) *How to apply a fixed finger splint*. MSD Manual Professional Version. msdmanuals.com		

5.2 Application of Buddy Splint

Objective	Immobilize/relief pain & swelling		
Indication	Closed fracture phalanx (hand & foot) except thumb		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read instruction 2. Register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Review the X-ray 2. Confirm the fracture site 3. Assess deformity of the extremeties 4. Check condition of wound if any 4.1. Swollen 4.2. Bruises 4.3. Numbness 4.4. Blister 4.5. Tense 4.6. Reduced sensation 4.7. Reduced pulse 4.8. Check Neurovascular status, movement of thelimb and pain score 5. Remove accessories if any 6. Refer doctor if any abnormalities found and patient might be not fit for the procedure 7. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO.01/17 MOH 3. Pain score scale

3. Prepare equipment and patient	1. Prepare equipment and medications 2. Check correct patient 3. Explain to patient relative/ parents the procedure to be carried out 4. Confirm with patient the affected extremity 5. Place patient in a comfortable position 6. Place linen protector under the injured limb		1. Adhesive plaster 2. Scissors 3. Soft padding/gauze 4. Personal Protection Equipment 5. Borang Senarai Semak Prosedur CMR dan Pemasangan Kast: LPP.ORTHO.01/17
4. Perform procedure	1. Review the X-ray 2. In straight full extension 3. Place affected finger or toe with adjacent finger 4. Place the affected finger or toe with the adjacent finger or toe 5. Place soft padding between the injured and adjacent finger for anatomical splinting 6. Wrap strips of tape around the fingers, securing tightly with plaster - 2 strips above and below the fracture site on the affected limb		1. X-ray (Pre & post reduction) - AP view - Lateral view 2. Personal Protection Equipment
5. Observation	1. Observe, record neurovascular status 2. Pain Score 3. Refer to doctor if any complication arises	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
6. Post procedure advice care	1. Wound care 2. Encourage movement of extremities 3. Care of splint 4. Advise patient to return		1. Health Education: LPP.ORTHO.02/17 (Orthopedic Advice Slip)

	to Orthopaedic Out-Patient Clinic/ EmergencyDepartment immediately if develops: 4.1. Swelling 4.2. Severe pain 4.3. Numbness 4.4. Monitor for any change in color of extremities 4.5. Fever 4.6. Foul smell		
7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. Panduan Praktikal Pemasangan Plaster Kast (KKM) Edisi ke 2(2012) 2. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006) 3. *Pain The 5th Vital Sign third Edition* 4. *Policies & Procedures on Infection Prevention and Control* (KKM) 5. *AO Trauma Casts, Splints, And Support Bandages – Non operative Treatmentand Periopertive Protection*		

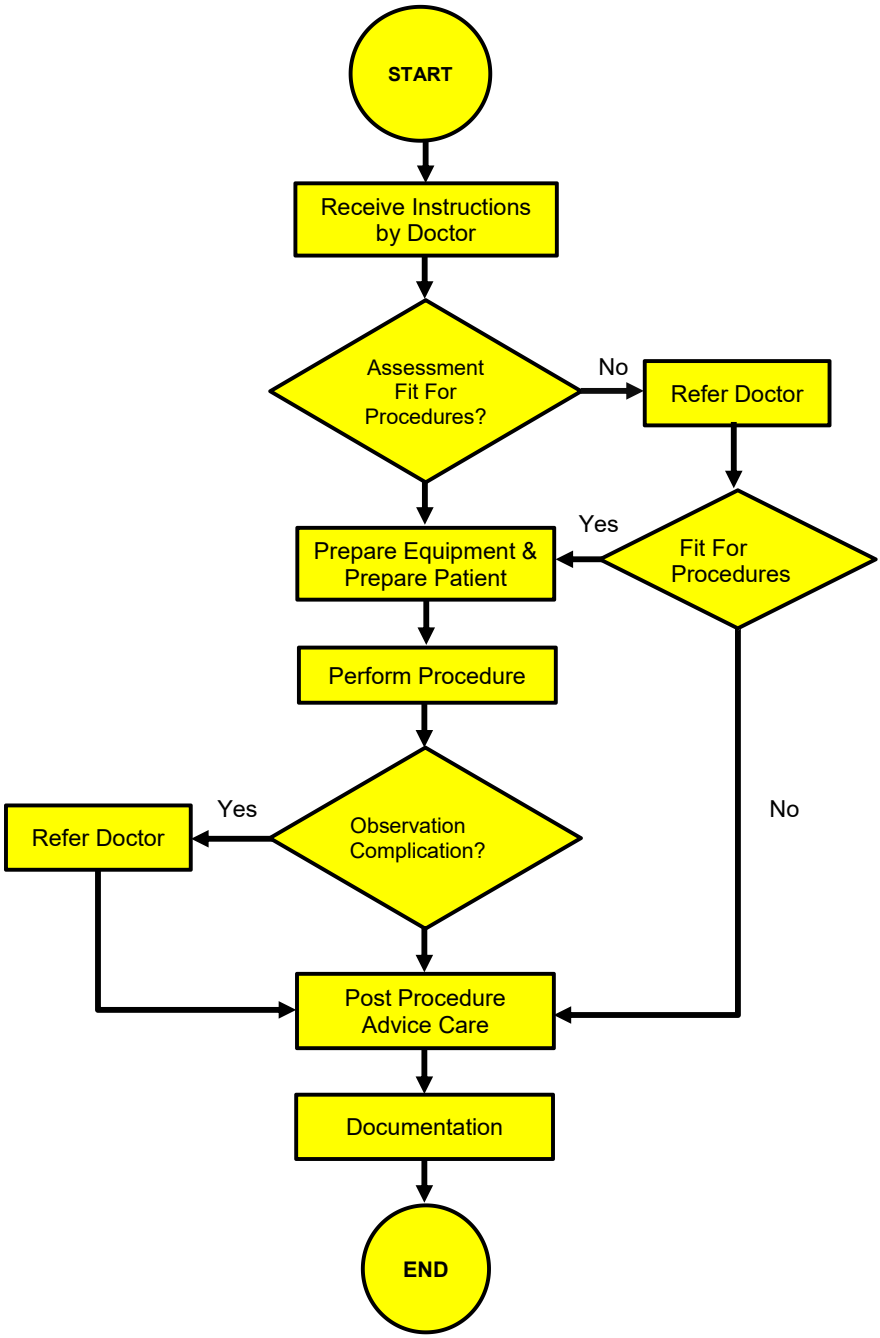
CHAPTER 6 : APPLICATION OF BANDAGING AND STRAPPING

6.1 Application Collar and Cuff

6.2 Application Stump Bandage

6.3 Application Robert Jones Bandage

*All procedure in this chapter need more than 1 healthcare provider to perform


START
Receive Instructions by Doctor
Assessment Fit For Procedures?
No
Refer Doctor
Fit For Procedures
Yes
Prepare Equipment & Prepare Patient
Perform Procedure
Observation Complication?
Yes
Refer Doctor
No
Post Procedure Advice Care
Documentation
END

CHAPTER 6: WORK PROCESS APPLICATION OF BANDAGING AND STRAPPING

6.1 Application Collar and Cuff

Objective	Reduce pain and reduction of fracture by gravity		
Indication	Fracture proximal and upper third of humerus, surgical neck of humerus or head of humerus		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read instruction 2. Register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Review the X-ray 2. Confirm the fracture site 3. Assess skin condition of the limb 4. Check abnormality for cuff application: 4.1. Swollen 4.2. Bruises 4.3. Numbness 4.4. Blister 4.5. Reduced sensation 4.6. Reduced pulse 5. Pain score 7. Remove accessories if necessary 8. Refer doctor if any abnormalities found and patient might be not fit for the procedure 9. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Pain score scale

3. Prepare equipment and patient	1. Prepare equipment 2. Explain to patient/relative about procedure 3. Confirm with patient the affected limb 4. Position the patient comfortably		1. Sling cuff 2. Scissor 3. Personal Protection Equipment
4. Perform procedure	1. Patient in an upright position 2. With the help of an assistant position the affected limb in 90° elbow flexion 3. Put the padded sling over the neck to the wrist and secure the two end		
5. Observation	1. Observe, record neurovascular status 2. Pain Score 3. Refer to doctor if any complication arises	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
6. Post procedure advice care	1. Wound care 2. Encourage movement of extremities 3. Care of splint 4. Advise patient to return to Orthopaedic Out-patient clinic/Emergency Department immediately ifany of the condition belowdevelop: 4.1. Swelling 4.2. Severe pain 4.3. Numbness 4.4. Change in Extremities 4.5. Fever 4.6. Foul smell		1. Health Education: LPP.ORTHO.02/1 (OrthopedicAdvice Slip)7

7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006) 2. *Pain The 5th Vital Sign third Edition* (2018) 3. *Policies & Procedures on Infection Prevention and Control* (KKM) (2019) 4. *AO Trauma Casts, Splints, And Support Bandages – Non operative Treatment and Periopertive Protection* 5. Collar and Cuff Sling, (2022,August).nationwidechildren.org		

6.2 Application Stump Bandage

Objective	Reduce swelling/Shape for prosthesis		
Indication	Heeled amputated stump		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instruction by doctor and registration	1. Read instruction 2. Register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Assess the scar of the skin condition of the limb 2. Check abnormality of the stump: 2.1. Swollen 2.2. Bruises 2.3. Blister 3. Pain score 4. Refer doctor if any abnormalities found and patient might be not fit for the procedure 5. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Pain score scale
3. Prepare equipment and patient	1. Prepare equipment 2. Confirm correct patient 3. Explain to patient/ relative about the procedure 4. Place patient in supine position		1. Adhesive plaster 2. Crepe bandage 5. Scissor 6. Personal Protection Equipment 3. Linen protective sheet

4. Perform procedure	1. Hold the affected limb carefully 2. Padding the healed scar 3. Place one end of the bandage just above the knee and wrap it down the side of the stump, over the end, then back up the other side to above the knee. Repeat this step until the roll stump end covered completely. Turn the bandage horizontally and circle it around the leg to secure to secure both sides. Avoid wrinkling or over stretching the bandage throughout the wrapping process 4. Continue with another layer to cover the stump with a spiral/figure-of-eight technique and cover above the joint by bandaging *Adherence to the same principle *For finger use tubular elastic net bandage. Refer Diagram 2 & 3		
5. Observation	1. Pain Score 2. Refer to doctor if any complication arises	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Pain score scale
6. Post procedure advice care	1. Encourage movement of extremities 2. Care of stump bandage 3. Advise patient to return to Orthopaedic		1. Health Education: LPP.ORTHO.02/17 (Orthopedic Advice Slip)

	Outpatient clinic/ Emergency Department immediately if any of the condition below develop: 3.1 Swelling 3.2 Severe pain 3.3 Numbness 3.4 Change in extremities 3.5 Fever 3.6 Foul smell		
7. Documenation	1. Document the procedure		1. Procedure record system
8. Reference	1. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006) 2. *Pain The 5th Vital Sign third Edition* (2018) 3. *Policies & Procedures on Infection Prevention and Control* (KKM) (2019) 4. *AO Trauma Casts, Splints, And Support Bandages – Non operative Treatment and Periopertive Protection* 5. Stump Wrapping, Below the Knee, Discharge instruction. (2021,May08),Mount Nittany Health		

Diagram 2 : Stump Bandaging for Below Knee Amputation

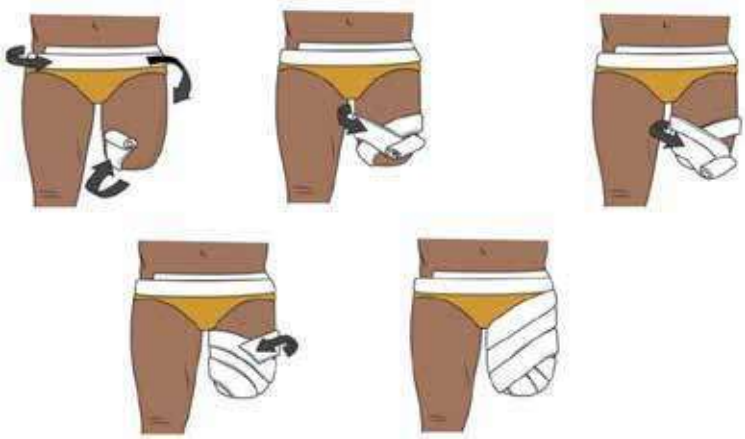


Diagram 3 : Stump Bandaging for Above Knee Amputation

6.3 Application Robert Jones Bandage

Objective	Reduce swelling & relief pain		
Indication	Soft tissue injury over the knee/ankle		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instruction by doctor and registration	1. Read instruction 2. Registration patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Review the X-ray 2. Assess skin condition ofthe limb 3. Check any abnormality 3.1 Swollen 3.2 Bruises 3.3 Numbness 3.4 Blister 4. Check neurovascular status, movement of thelimb and pain score 5. Refer doctor if any abnormalities found and patient might be notfit for the procedure 6. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral View 2. Pain score scale
3. Prepare equipment and Patient	1. Prepare equipment 2. Confirm correct patient 3. Explain to patient/relative the procedure 4. Confirm with patient the affected limb 5. Position the patient comfortably		1. Orthoban 2. Adhesive Plaster 4. Crepe bandage Scissor 5. Personal Protection Equipment 6. Linen/Protective sheet

4. Perform Procedure	1. Apply a layer of Orthoban bandage from mid-thigh to mid-calf 2. Maintain knee flexion at 15° 3. Wrap a layer of crepe bandage firmly on the orthoban 4. Apply second layer of orthoban 5. Apply second layer crepe bandage 6. Apply third layer of orthoban 7. Followed by third (final) layer crepe bandage *For the ankle joint, keep the joint in a plantigrade position and start bandaging from mid-calf to metatarsophalangeal joint (MTPJ) level		
5. Observation	1. Observe, record neurovascular status 2. Pain score 3. Refer to doctor if any complication arises	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
6. Post procedure advice care	1. Encourage movement of extremities 2. Care of bandaging 3. Advise patient to return to Orthopaedic Out-Patient Clinic/Emergency Department immediately if any of the condition below develop : 3.1. Swelling 3.2. Severe pain 3.3. Numbness 3.4. Change in		1. Health Education: LPP.ORTHO.02/17 (Orthopedic Advice Slip)

	extremities 3.5. Fever 3.6. Foul smell		
7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. Panduan Praktikal Pemasangan Plaster Kast (KKM) Edisi ke 2(2012) 2. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006) 3. *Pain The 5th Vital Sign third Edition* (2018) 4. *Policies & Procedures on Infection Prevention and Control* (KKM) (2019) 5. *AO Trauma Casts, Splints, And Support Bandages – Non operativeTreatment and Periopertive Protection*		

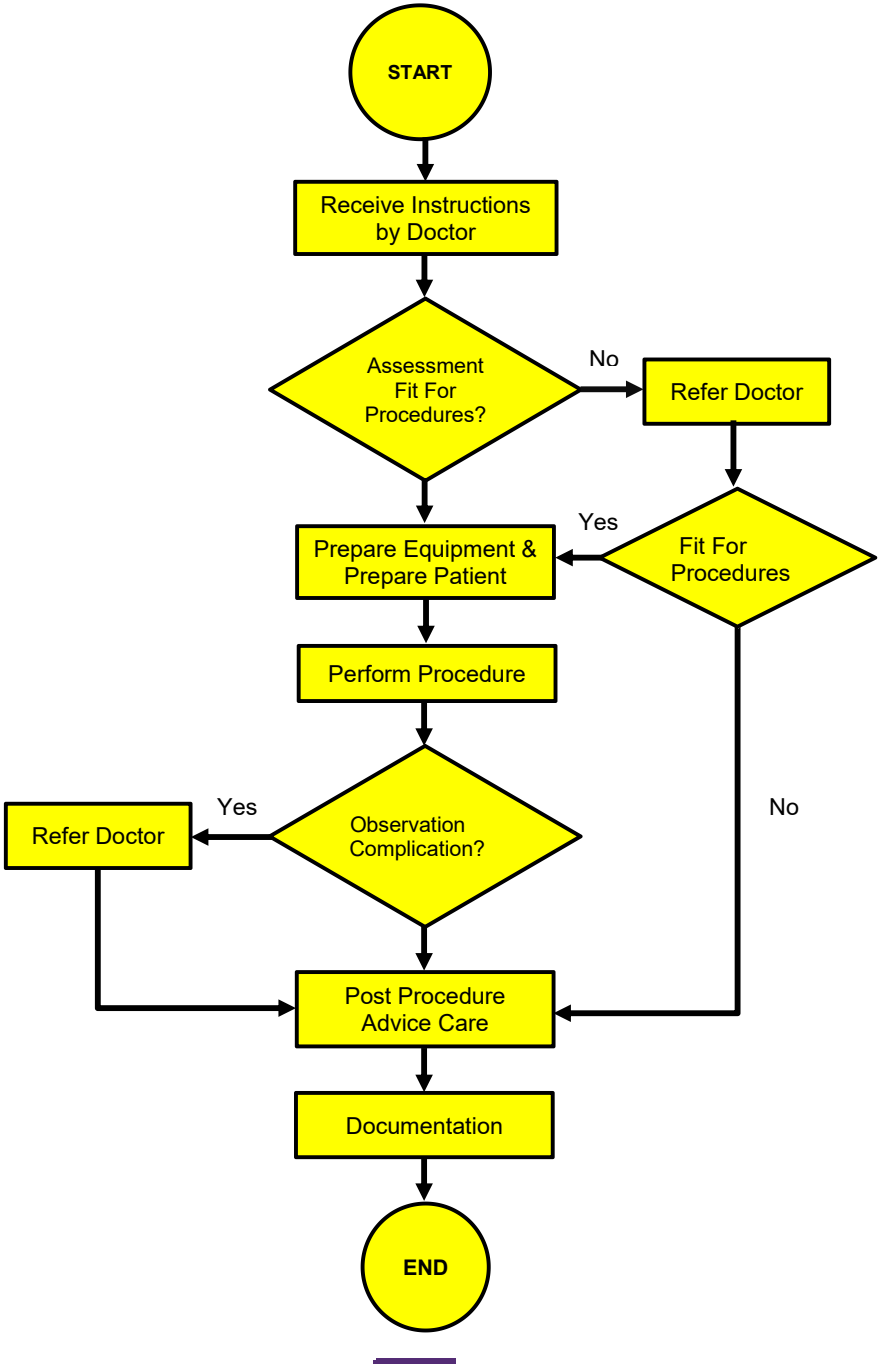
CHAPTER 7 : APPLICATION OF ORTHOSIS

7.1 Thoracolumbar Sacral Orthosis (TLSO)

7.2 Hinge Knee Brace

7.3 Ankle Brace

*All procedure in this chapter need more than 1 healthcare provider to perform


START
Receive Instructions by Doctor
Assessment Fit For Procedures?
No
Refer Doctor
Fit For Procedures
Yes
Prepare Equipment & Prepare Patient
Perform Procedure
Observation Complication?
Yes
Refer Doctor
No
Post Procedure Advice Care
Documentation
END

CHAPTER 7 : WORK PROCESS APPLICATION OF ORTHOSIS

Activity	Work Process	Standard	Requirements
1. Receive instruction by doctor and registration	1. Read instruction 2. Registration patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Review the X-ray 2. Confirm affected area 3. Assess the area to be protected 4. Check neurovascular status,movement of the area/limb 5. Pain score 6. Refer doctor if any abnormalities found and patient might be not fit for the procedure 7. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Pain score scale
3. Prepare equipment and patient	1. Prepare equipment as a required 2. Confirm correct patient 3. Explain to patient/relative about procedure 4. Confirm with patient the affected area/limb 5. Position the patient comfortably 6. Place linen protector under the injured area/limb		1. Measuring tape 2. Orthosis
4. Perform procedure	**Refer Application of Orthosis** **Chapter 7** **Work Procedure (7.1– 7.3)**		1. X-ray (Pre & post reduction) - AP view - Lateral view 2. Personal Protection Equipment

5. Observation	1. Observe, record neurovascular status 2. Pain score 3. Refer to doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
6. Post procedure advice care	1. Care the wound if any 2. Encourage movement of extremities care of orthosis 3. Advise patient to return to Orthopaedic Out-Patient Clinic/Emergency Department immediately if any of thecondition below develop: 3.1. Swelling 3.2. Severe pain 3.3. Numbness 3.4. Change in extremities 3.5. Fever 3.6. Foul smell		1. Health Education: LPP.ORTHO.02/17 (Orthopedic Advice Slip)
7. Documentation	1. Document the procedure		1. Procedure record system

7.1. Thoracolumbar Sacral Orthosis (TLSO)

Objective	To support thoracolumbar spine by preventing twisting and flexion
Indication	Stable spine compression fracture T6 - L4
Activity	**Work Process**
Perform procedure	1. Reviewing X-rays before proceeding with a procedure 2. Maintain privacy 3. Principle of Thoracolumbar Sacral Orthosis (TLSO) application (3 point fixation) 3.1. **Thoracic Region:** The first point of contact is usually in the thoracic (mid-back) region. This helps in controlling the upper part of the spine, providing stability and support 3.2. **Lumbar Region:** The second point of contact is in the lumbar (lower back) region. This contributes to stabilization in the lower part of the spine and prevents excessive movement 3.3. **Sacral or Pelvic Region:** The third point of contact is in the sacral or pelvic region. This helps in controlling movement at the base of the spine and provides overall stability to the orthosis 4. Application of TLSO 4.1. Wear a Body-Hugging Shirt 4.2. Position the Cover Frame Below the Sternal Notch 4.3. Place the Lower Frame at the Symphysis Pubis 4.4. Position the Posterior Pad at the Thoracolumbar Junction 4.5. Ensure Firm Fixation to Maintain Position 5. Advice patient: 5.1. ADL (Activities of Daily Living) 5.2. Skin care 5.3. Orthosis care 6. Variant of TLSO 6.1. Thoracolumbar Orthosis eg: Jewett Brace for T6 - L2 fracture (single column fracture) 6.2. Lumbosacral Orthosis L3 - S1 fracture (stable fracture) ***Contraindication** : Multiple level unstable fracture, Osteoporotic fracture

Reference	1. CVA, K. (2017). https://www.medwinpublishers.com/JOBD/JOBD16000139.pdf. JournalofOrthopedics & Bone Disorders, 1(7). https://doi.org/10.23880/jobd-16000139 2. Mehta, S., Yusuf, B. S., Chiew, D. L. M., Rathore, S., Reddy, N. R., Nair, D., Mahajan, U., Madhusudhan, T., & Adhiyaman, V. (2022). Thoracolumbar sacral orthosis for spinalfractures: What's the evidence and do patients use them? Cureus. https://doi.org/10.7759/cureus.31117 3. Santosa, A., Irwanto, A., & Khotimah, H. (2023, March 6). Design and Development of Thoracic Lumbar Sacral Orthosis Brace to Reduce Back Pain. IJNP (Indonesian Journalof Nursing Practices), 6(2). https://doi.org/10.18196/ijnp.v6i2.17303

7.2. Application Of Hinge Knee Brace

Objective	Support and stabilize the knee
Indication	1. Prophylactic 2. Rehabilitative 3. Functional
Activity	**Work process**
Perform Procedure	1. Reviewing X-rays before proceeding with a procedure 2. Maintain privacy 3. Position hinge bars laterally and medially on the leg, ensuring the center hinge aligns with the knee joint 4. Firmly fasten the upper limb and lower limb segments 5. Ensure that the hinge is centered on the knee joint 6. Loosely fasten the remaining two straps 7. Advise the patient to perform the following exercises: 6.1 Range of Motion 6.2 Static Quadriceps Exercise 6.3 Single Leg Raise 6.4 Ankle Foot Pump 6.5 Patella Mobilization
Reference	1. Lee H, Ha D, Kang Y-S and Park H-S (2016) Biomechanical Analysis of the Effects of BilateralHinged Knee Bracing. Front. Bioeng. Biotechnol. 4:50. https://www.frontiersin.org/articles/10.3389/fbioe.2016.00050/full 2. Naito, Y., Kamiya, M., Kanai, A., & Ota, S. (2019). Enhancement of walking ability using a custom-made hinged knee brace in patients who experienced ambient stroke and are inthe acute phase. Journal of Physical Therapy Science, 31(11), 913–916. https://doi.org/10.1589/jpts.31.913 3. Ochi, A., Ohko, H., Ota, S., Shimoichi, N., Takemoto, T., & Mitsuke, K. (2018). Custom-madehinged knee braces with extension support can improve dynamic balance. Journal of Exercise Science & Fitness. https://doi.org/10.1016/j.jesf.2018.08.002

CHAPTER 8 : APPLICATION OF SKIN TRACTION

8.1 Upper Limb

8.1.1 Lateral Traction

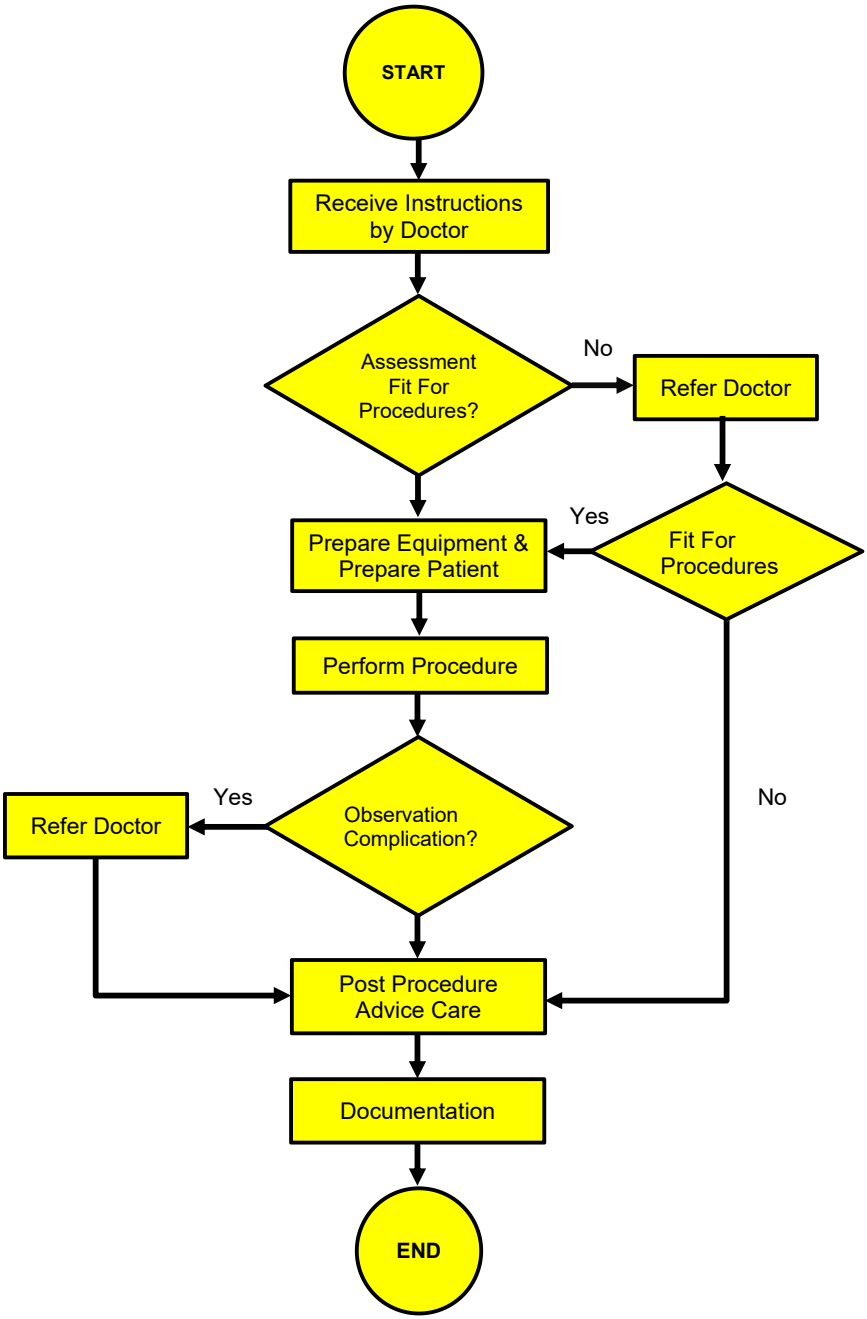
8.1.2 Dunlop Traction

8.2 Lower Limb

8.2.1 Gallows Traction

8.2.2 Buck's Traction

***All procedure in this chapter need more than 1 healthcare provider to perform**


START
Receive Instructions by Doctor
Assessment Fit For Procedures?
No
Refer Doctor
Fit For Procedures
Yes
Prepare Equipment & Prepare Patient
Perform Procedure
Observation Complication?
Yes
Refer Doctor
No
Post Procedure Advice Care
Documentation
END

CHAPTER 8 : WORK PROCESS APPLICATION OF SKIN TRACTION

Objective	Reduction, alignment and immobilize, to minimize deformity		
Indication	Short term of immobilization for fracture and dislocation		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read the instructions 2. Register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Confirm the affected limb 2. Check for skin condition 3. Ask patient for history of skin allergy. Refer doctor if patient had allergy 4. Check for any contraindicated eg: dermatitis, varicose veins, ischemic limb or insensate limb refer doctor if patient had any contraindicated as above 5. Don't apply at any area has contraindication condition 6. Do not apply over open wound 7. Check for neurovascular status 8. Pain score 9. Refer doctor if any abnormalities found and patient might be not fit for the procedure	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP View - Lateral view 2. Pain score scale

	10. If the patient fit for procedure, continue to prepare equipment		
3. Prepare Equipment and Patient	1. Prepare equipment 2. Check correct patient 3. Explain to patient/relative 4. Place patient in a supine position 5. Place a linen protector under the injured limb and clean the affected limb		**Skin Traction Equipment** 1. Skin traction kit 2. Crepe bandage 3. Felt 4. Thomas splint 5. Calico 6. Scissors 7. Adhesive plaster 8. Cotton wool roll/ roller gamgee 9. Linen protector 10. Pillow 11. Weight-option **Gallows Traction Cot Equipment** 1. 1 Long bar 2. 2 Cross clamps 3. 4 Short bars with clamps 4. Cot 5. Plaster 6. Scissors
4. Perform Procedure	**Refer Application of Skin Traction** **Chapter 8** **Work Procedure (8.1-8.2)**		1. X-ray Film (Pre &post reduction) - AP view - Lateral view 2. Personal Protection Equipment

5. Observation	1. Observe, record neurovascular status 2. Pain score 3. Refer to doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
6. Post procedure advice care	1. Personal hygiene 2. Psychological support 3. Care of the skin traction 4. Physio therapy passive or active at affected limb if no contraindication 4.1. Do passive exercise of the affected limb 4.2 Do not scratch over traction area 5. Inform the staff if any problem		1. Health Education: LPP.ORTHO.02/17 (Orthopedic Advice Slip)
7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006) 2. *Pain The 5th Vital Sign third Edition* (2018) 3. *Policies & Procedures on Infection Prevention and Control* (KKM) (2019) 4. Traction in Orthopaedic (2016), *Vishwanath*, JJM Medical Collage,Davangere 5. Crib, N. (2022). "Nursing Management of Patients in Traction." Retrieved 29 July, 2022, from https://nursingcrib.com/demo-checklist/nursing-management-of-patients-in-traction/. 6. "Purpose of Traction ". (2022). Retrieved 29 july, 2022, from https://www.verywellhealth.com/traction-fracture-and-broken-bone- treatment-2548529. 7. "Traction an Effective Treatment?". (2022). Retrieved 29 July, 2022,from https://www.healthline.com/health/traction#recovery. 8. "Types of Traction." (2022). Retrieved 29 July, 2022, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7515792/.		

9. SKIN TRACTION." (2022). Retrieved 29 July, 2022, from https://www.worcsacute.nhs.uk/patient-information-and-leaflets/documents/patient-information-leaflets-a-z/2691-skin-traction/file.
10. "General considerations." (2022). Retrieved 29 July, 2022, from https://surgeryreference.aofoundation.org/orthopedic-trauma/adult- trauma/distal-femur/complete-articular-fracture-simple-articular- simple-methaphyseal/traction.
11. "Application of traction in orthopaedics ". (2022). Retrieved 29 July,2022, from https://www.slideshare.net/prabhnoorhayer/application-of-traction-in-orthopaedics

PRECAUTIONS ;

1. Do not apply over an open wound
2. Contraindicated in dermatitis, ischemic limb orinsensate limb
3. Sciatic nerve injury/Common peroneal injury
4. Contraindication for patients with skin allergy
5. Maintain principles of traction
    a) Position
    b) Counter traction
    c) Friction
    d) Continuous traction
    e) Line of pull

WORK PROCEDURE : APPLICATION OF SKIN TRACTION

8.1 UPPER LIMB

8.1.1 Lateral Traction

Objective	Reduction, alignment and immobilize to minimize deformity
Indication	Temporary management is essential before definitive treatment of a supracondylar humerus fracture in paediatric patients
Activity	**Work Process**
Perform Procedure	1. Assistant to hold the injured limb with care 2. Protect bony prominences using padding 3. Apply skin traction and provide additional support with a Thomas Splint 4. Position the arm in 60°- 90° of abduction with the forearm in supination 5. Maintain the elbow flexed within the range of 0° to 10° 6. Pass the traction cord over the pulley 7. Attach a weight to the traction cord, with the weight ranging from 2kg to 3.5kg based on the size and age of the patient 8. If necessary, place a pillow under the injured limb for added support
Reference	1. Steward, J.D.M., & Hallett, J.P 1983. Traction and Orthopaedic Appliances. Edinburgh Chirchill Livingtstone 2. Hall, A.J, & Stenner, R. 1985. Manual of Fracture Brancing. Edinburgh : Chirchill Livingstone 3. M. Z. Sadiq,T. Syed, J. Travlos (2006) *Management of grade III supracondylar fracture of the humerus by straight-arm lateral traction*, *Buckinghamshire, UK 31:155-158.*

8.1.2 Dunlop Traction

Objective	Reduction, alignment and immobilize to minimize deformity
Indication	Temporary management is essential before definitive treatment of a supracondylar humerus fracture in paediatric patients
Activity	**Work Process**
Perform procedure	1. Assistant to hold the injured limb with care 2. Protect bony prominences 3. Apply skin traction and bandage from the elbow to the wrist joint 4. Abduct the shoulder to 45° 5. Pass the traction cord over the pulley, ensuring the elbow is flexed to 45° 6. Place a padded sling over the distal humerus 7. Attach weight to both the traction cord and the padded sling cord, with the weight range from 1kg to 3.5kg depending on the size and age of the patient
Reference	1. *J Bone Joint Surg Am. (*1972). *Displaced supracondylar fractures of the humerus in children - treatment by Dunlop's traction. Dodge HS. 54:1408–1418.* 2. *Powell, H.D. (1973). Dunlop traction in supracondylar fractures of the humerus. Proc R Soc Med, 66(6), 515-7. PMID: 4781802; PMCID: PMC1645033*

WORK PROCEDURE : APPLICATION OF SKIN TRACTION

8.2 LOWER LIMB

8.2.1 Gallows Traction

Objective	Reduction, alignment and immobilize to minimize deformity
Indication	The treatment of femur shaft fracture up to age of 2 years and weight should be less than 12kg
Activity	**Work Process**
Perform Procedure	1. The assistant should hold the injured limb with care 2. Protect bony prominences 3. Pull of limb and apply traction 4. Apply skin traction and bandage to the both lower limbs 5. Apply Gallows Traction Cot : a) Affix cross clamps evenly to the head and foot of the cot, ensuring sufficient space for the child to lay comfortably b) Attach the long bar to create an overhead bar c) Fix a pulley to the end of each short bar d) Clamp a short bar with a pulley to the part of the bar that hangs over the outside of the cot e) Clamps 2 short bars with pulleys to the overhead bar to align with the child's hips 6. Tie traction cord to an overhead beam 7. Tighten the traction cord to lift the buttocks just off the mattress 8. Implement Gallows Traction by lifting the legs up, creating an 'L' shape with the body 9. Ensure the traction is secure
Reference	1. Gallows traction.(2022,June) SouthamptonChildren's.www.uhs.utk/childrenshospital 2. Duperouzel W, Gray B, Santy-Tomlinson J. *Int J., (2018). The principles of traction and the application of lower limb skin traction. Orthop Trauma Nurs. 29: 54–57.* 3. Wendy, D. a., Beverley, G. b., Julie, S. –T., (2018). *Practice development in orthopaedics and trauma. The principles of traction and the application of lower limb skin traction. International Journal ofOrthopaedic and Trauma Nursing 29: 54-57* 4. James B. Hunter, Injury, Int. J Care Injured (2005). *Femoral Shaft Fractures in Children*

8.2.2 Buck's Traction

Objective	Reduction, alignment and immobilize to minimize deformity
Indication	Used in temporary management of fracture of femoral neck, undisplaced fractures of the acetabulum, after reduction of hip dislocation
Activity	**Work Process**
Perform Procedure	1. The assistant should hold the injured limb with care 2. Protect bony prominences with padding 3. Maintain alignment of the limb by aligning the second toe, the midpoint of the patella, and the Anterior Superior Iliac Spine (ASIS) 4. Apply skin traction by strapping the affected lower limb and attaching weight 5. Apply the strap to the lower leg, securing it from the level of the lateral malleolus to the medial malleolus 6. Pass the cord from the spreader over the pulley 7. Attach weight to both the traction cord and the padded sling cord, with the weight ranging from 2kg to 4.5kg, depending on the size and age of the patient 8. Place a pillow under the injured limb if required
Reference	1. "Universal Buck's Traction." (2022). Retrieved 29 July, 2022, from https://www.djoglobal.com/products/procare/universal-Buck's-traction. 2. Brandon Callahan., (2023). *Bone Fracture. Buck's Traction for Hip Fractures: A Comprehensive Guide*.

CHAPTER 9 : APPLICATION OF SKELETAL TRACTION

9.1 Application of Skull Tong Traction

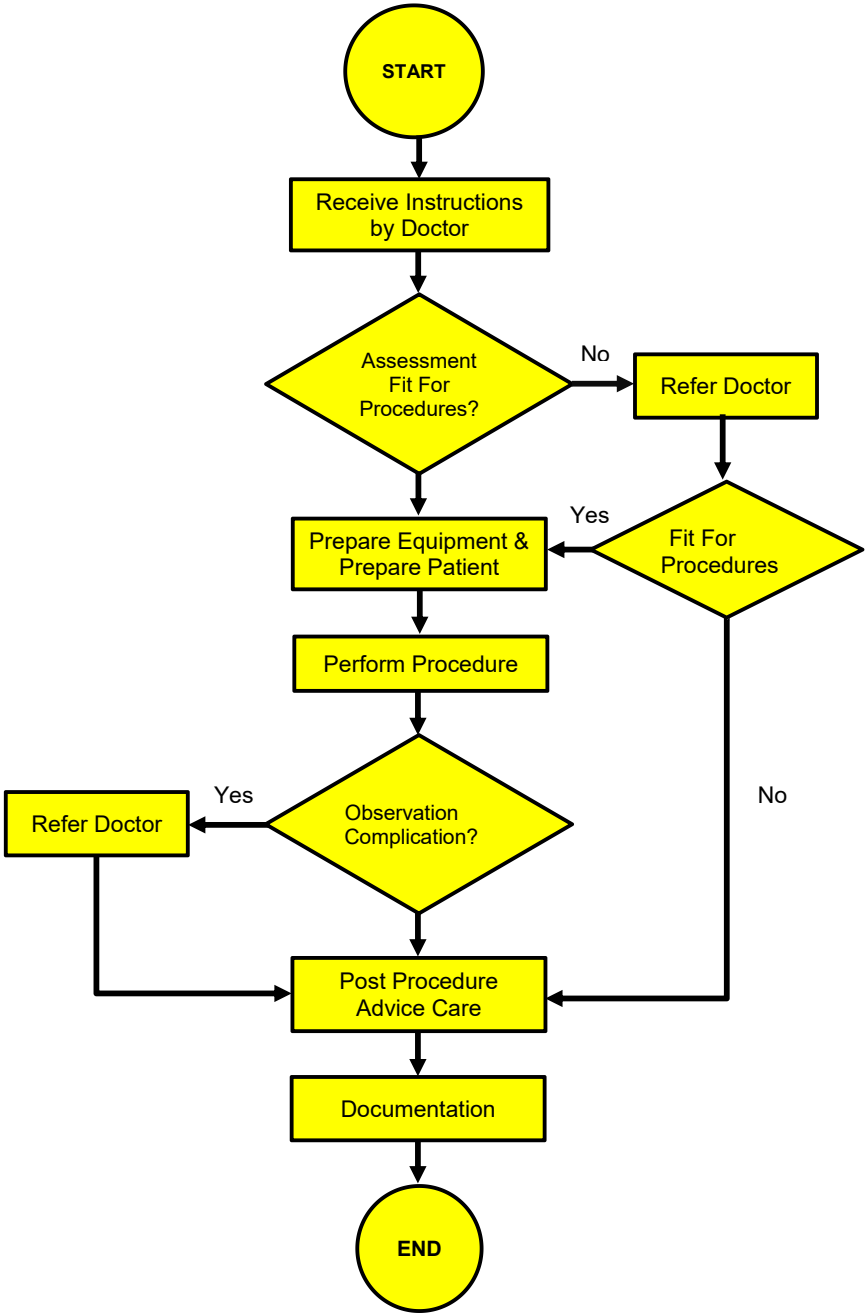
9.2 Application of Skeletal Traction (Lower Limbs)

9.2.1 Calcaneum Pin Traction

9.2.2 Distal Femoral Traction

9.2.3 Proximal Tibial Traction

***All procedure in this chapter need more than 1 healthcare provider to perform**


START
Receive Instructions by Doctor
Assessment Fit For Procedures?
No
Refer Doctor
Fit For Procedures
Yes
Prepare Equipment & Prepare Patient
Perform Procedure
Observation Complication?
Yes
Refer Doctor
No
Post Procedure Advice Care
Documentation
END

WORK PROCESS : APPLICATION OF SKELETAL TRACTION

9.1 Application of Skull Tong Traction

Objective	Reduction, re-alignment and immobilize
Indication	Conservative treatment of cervical fractures and dislocations
Activity	**Work Process**
Perform Procedure	1. Patient on supine reverse Trendelenburg 2. Maintain alignment of cervical 3. Secure the traction cord to the Skull Traction Tongs, pass it over the pulley and attach the weight 4. Elevate the head end of the bed to provide counter traction 5. Applying an initial weight of 5kg. Evaluate neurological status after completing the procedure 6. Dressing the pins site wound 7. Principles of traction: I. Position II. Counter traction III. Friction IV. Continuous traction V. Line of pull * Weight can be added every 30 minutes, followed by neurological assessment and lateral cervical X-ray
Reference	1. Law MD, Berhardt M, White AA (1994) Evaluation and Management of Cervical Spondylitic myelopathy ; Journal of Bone and Joint 2. Agarwal AK, Peppelman WC, Kraus DR, Eisenbeis CH (1993)The Cervical sspine in rheumatoid arthritis, British Medical Journal306, 79-80 3. Anderson, L.D ; D'Alonzo, R.T. Fracture of the Odontoid process the axis. J Bone Joint Surg Am 56:1663-1674, 1974 4. Derek Moore, D. (2021, June 23). Close cervical traction. OrthoBullet. https://www.orthobullets.com/spine/2074/closed-cervical-traction 5. Saleh, H., Yohe, N., Razi, A., Saleh, A. (2018). Efficacy and complications of the use of Gardner-Wells Tongs: a systematic review.Journal of Spine Surgery, 4(1), 123-129. https://doi.org/10.21037/jss.2018.03.03

WORK PROCESS : APPLICATION OF SKELETAL TRACTION (LOWER LIMB)

OBJECTIVE	Reduction re-alignment and immobilize		
INDICATION	Displaced unstable fractures/dislocations of the extremity joint		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions and Registration	1. Read instruction 2. Register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Confirm the fracture site/abnormalities 2. Assess deformity of the limb 3. Check Neurovascular status, movement of the limb 4. Pain score 5. Refer doctor if any abnormalities found and patient might be not fit for the procedure	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Pain score scale
3. Prepare equipment and prepare patient.	1. Prepare equipment 2. Explain to patient/relative the procedure 3. Position the patient comfortably	1. Manual for Sterile Preparation KKM Second Edition 2021 2. KKM Consent Form PER/CONSENT/ 2016	1. Bedside traction 2. Pulley Bracket/Buck extension Stirrup 3. Thomas Splint 4. Bohler Braun Frame (BBF) 5. Weight and hook 6. Pillow

4. Perform Procedure	**Refer Application of Skeletal Traction** **Chapter 9** **Work Procedure (9.1 - 9.3)**	1. Guidelines for House Officer (Orthopaedic) 2. Policies and Procedures on Infection Prevention and Control KKM thirdedition 2019	1. X-ray (Pre & post reduction) - AP view - Lateral view 2. Personal Protection Equipment 3. Weight
5. Observation	1. Observe, record neurovascular status pain score 2. Refer to doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Circulation chart 2. Pain score scale
6. Post procedure advice care	1. Personal hygiene 2. Psychological support 3. Care of traction must be given 4. Keep the weight always hanging free		
7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006) 2. *Pain The 5th Vital Sign third Edition* (2018) 3. *Policies & Procedures on Infection Prevention and Control* (KKM) (2019) 4. Traction in Orthopaedic (2016), *Vishwanath*, JJM Medical Collage, Davangere 5. AO(n.d)Skeleton traction Basic technique.surgeryreference.org 6. Knegse, K.P., Ganse, B., Haefel, P.C., Migliorini, F., Scaglioni, M.F., (2021). Trochanteric femur fractures: application of skeletal traction during surgery does not alter soft-tissue microcirculation. Medicina (Kaunas), 57(9):884. https://doi.org/10.3390/medicina57090884. PMID: 34577807; PMCID: PMC8468761. 7. Medically Reviewed by Nayana Ambardekar, MD on May 10, 2023 Written by WebMD Editorial Contributors https://www.webmd.com/pain-management/what-is-skeletal-traction		

WORK PROCEDURE

9.2 Application of Skeletal Traction (Lower Limb)

9.2.1 Calcaneum Pin Traction

9.2.2 Distal Femoral Traction

9.2.3 Proximal Tibial Traction

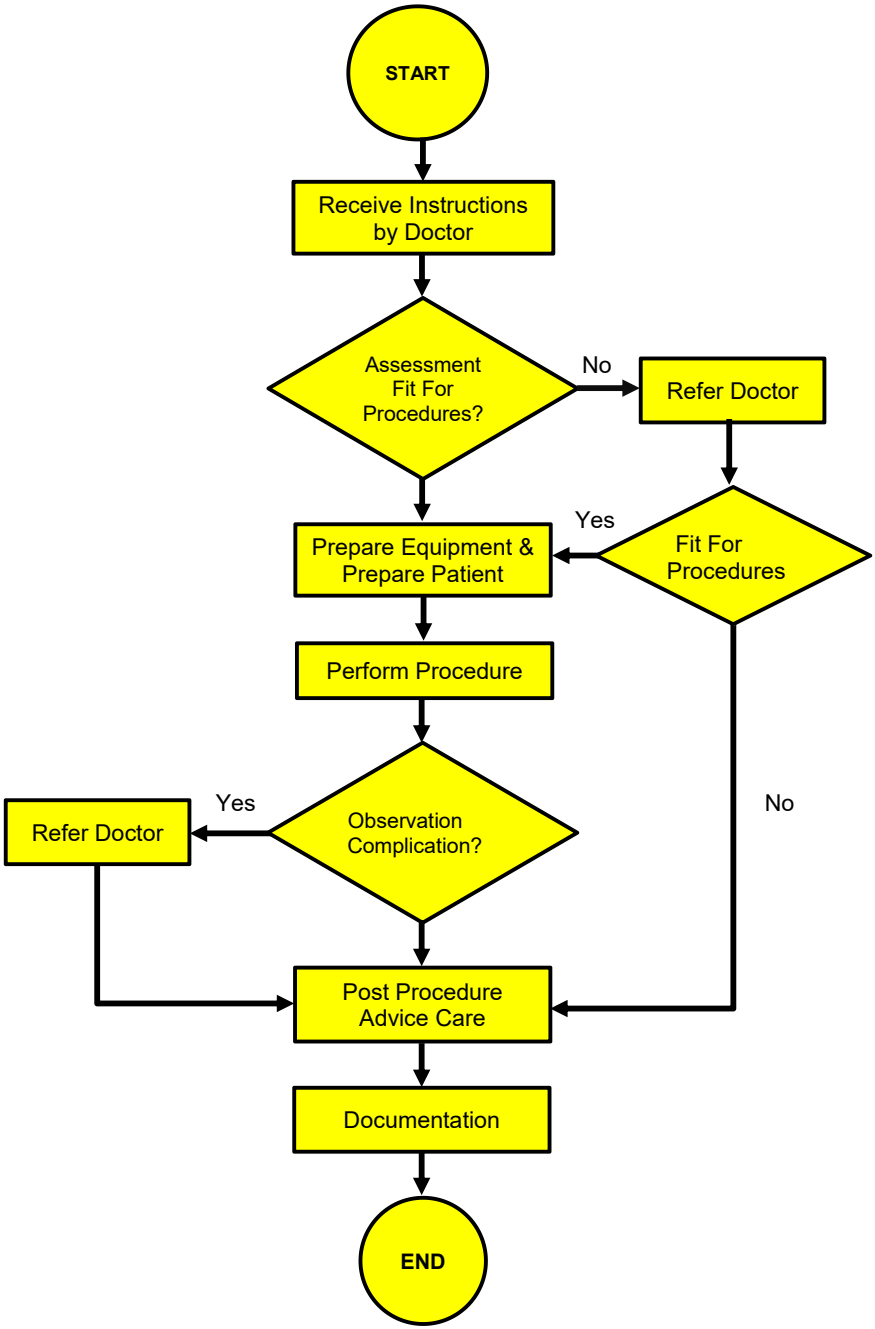
Objective	Reduction, alignment and immobilize To minimize deformity
Indication	1. Tibial shaft fracture 2. Fracture femur 3. Acetabular fractures
Activity	**Work Process**
Perform Procedure	1. Neurovascular assessment (before and after) 2. With the help of an assistant hold the affected limb carefully 3. Maintain alignment of limb (second toe, mid of patella and anteriorsuperior iliac spine - ASIS) 4. Immobilize the limb with a Thomas Splint or Bohler Braun Frame (BBF) 5. Apply the stirrup and secure/tighten the nuts to the Steinman Pin 6. Tie the traction cord to the stirrup, pass it over the pulley, and attach the weight 7. Weight not to exceed 1/10 of body weight 8. Dressing the pins site wound 9. Principles of traction: 9.1. Position 9.2. Counter traction 9.3. Friction 9.4. Continuous traction 9.5. Line of pull
Reference	1.Traction Principles and Application. (2024,July) Royal College of Nursing.www.Ron.org.uk

CHAPTER 10 : APPLICATION AND REMOVAL HALO VEST

10.1. Assisting in Application Halo Vest

10.2. Removal of Halo Vest

***All procedure in this chapter need more than 1 healthcare provider to perform**


START
Receive Instructions by Doctor
Assessment Fit For Procedures?
No
Refer Doctor
Fit For Procedures
Yes
Prepare Equipment & Prepare Patient
Perform Procedure
Observation Complication?
Yes
Refer Doctor
No
Post Procedure Advice Care
Documentation
END

CHAPTER 10 : WORK PROCESS ASSISTING IN APPLICATION OF HALOVEST

10.1. Assisting in Application of Halovest

Objective	To immobilize cervical spinal injuries		
Indication	Upper cervical spine injury		
Activity	**Work Process**	**Standard**	**Requirement**
1. Receive instructions by doctor and registration	1. Read the instructions 2. Register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Check any wound 2. Check neurological status 3. Pain score	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Pain score scale
3. Prepare equipment and prepare patient	1. Prepare equipment as measured 2. Check correct patient 3. Explain to patient/relative the procedure. 4. Verify consent 5. Position the patient comfortably	1. Manual for Sterile Preparation KKM second edition 2021 2. KKM Consent Form PER/CONSENT/ 2016	**Equipment** 1. Halo ring 2. Halo pin locknut 3. Halo vest 4. Upright bars 5. Halo pins 6. Torque screwdriver 7. Wrenches 8. Allen wrenches 9. Bolt 10. Blade size 11 11. Scissors 12. Shaving set 13. Syringes 15. Needle 16. Local anesthesia 17. Alcohol swab 18. Povidone 19. Dressing set

			20. Cotton & gauze 21. Adhesive plaster 22. Linen protector **Patient** 11. 1. Consent form
4. Perform Procedure	1. Maintain privacy throughout the entire procedure 2. Local anesthesia given by doctor 3. Maintain alignment of the cervical spine with a hard collar 4. Apply the Halo vest to the patient, ensuring correct positioning 5. Ensure that all bolts and nuts, thoracic bands, and shoulder straps are properly tightened Dressing any wound at the pin site	1. Guidelines For House Officer (Orthopaedic) 2. Policies and Procedures on Infection Prevention and Control KKM Third Edition 2019	1. X-ray - AP view - Lateral view 2. Personal Protection Equipment
5. Obsevation	1. Observe, record neurological status 2. Pain score Refer to doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. ASIA Chart 2. Pain score scale
6. Post procedure advice care	1. Personal hygiene 2. Psychological support Care the wound if any 3. Advise patient to come to Orthopaedic Out-Patient Clinic/Emergency Department immediately if any of the condition below develop: 3.1. Severe pain 3.2. Numbness /		1. Health Education: LPP.ORTHO.02/ 17(Orthopedic Advice Slip)

	weakness 3.3. Fever 3.4. Pin site infection 3.5. Construct loose		
7. Documentation	1. Document the procedure in procedure record system		1. Procedure record system
8. Reference	1. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006) 2. *Pain The 5th Vital Sign third Edition* 3. *Policies & Procedures on Infection Prevention and Control* (KKM) 4. Babashahi, A., Author_Id, N., Rezvani, M., Vatankhah, M., Kalani, N., Kazeminezhad, A., Author_Id, N., Author_Id, N., Author_Id, N., & Author_Id, N. (2021). Complications of halo vest orthosis: a Narrative study. Iranian Journal of Neurosurgery, 7(3), 131– 138. https://doi.org/10.32598/irjns.7.3.2 5. CVA, K. (2017). https://www.medwinpublishers.com/JOBD/JOBD16000139.pdf. Journal of Orthopedics & Bone Disorders, 1(7). https://doi.org/10.23880/jobd-16000139 6. Yang, H., Sun, Y., Wang, L., Gao, C., Yu, F., Xu, T., & Lü, X. (2021). Upper Cervical Spine Fracture-Dislocation in patients with ankylosing spondylitis: Application of halo vest before and during posterior surgery.Research Square (Research Square). https://doi.org/10.21203/rs.3.rs- 557216/v1		

PRECAUTIONS FOR PATIENT (MUST BE EXPLAIN)

1. Do not allow anyone to hold and pull on the rod and vest
2. Do not try twist or bend your neck
3. Do not loosen or adjust your vest or pin

CONTRAINDICATION

1. Cranial fracture
2. Severe soft tissue injury
3. Severe chest trauma
4. Polytrauma

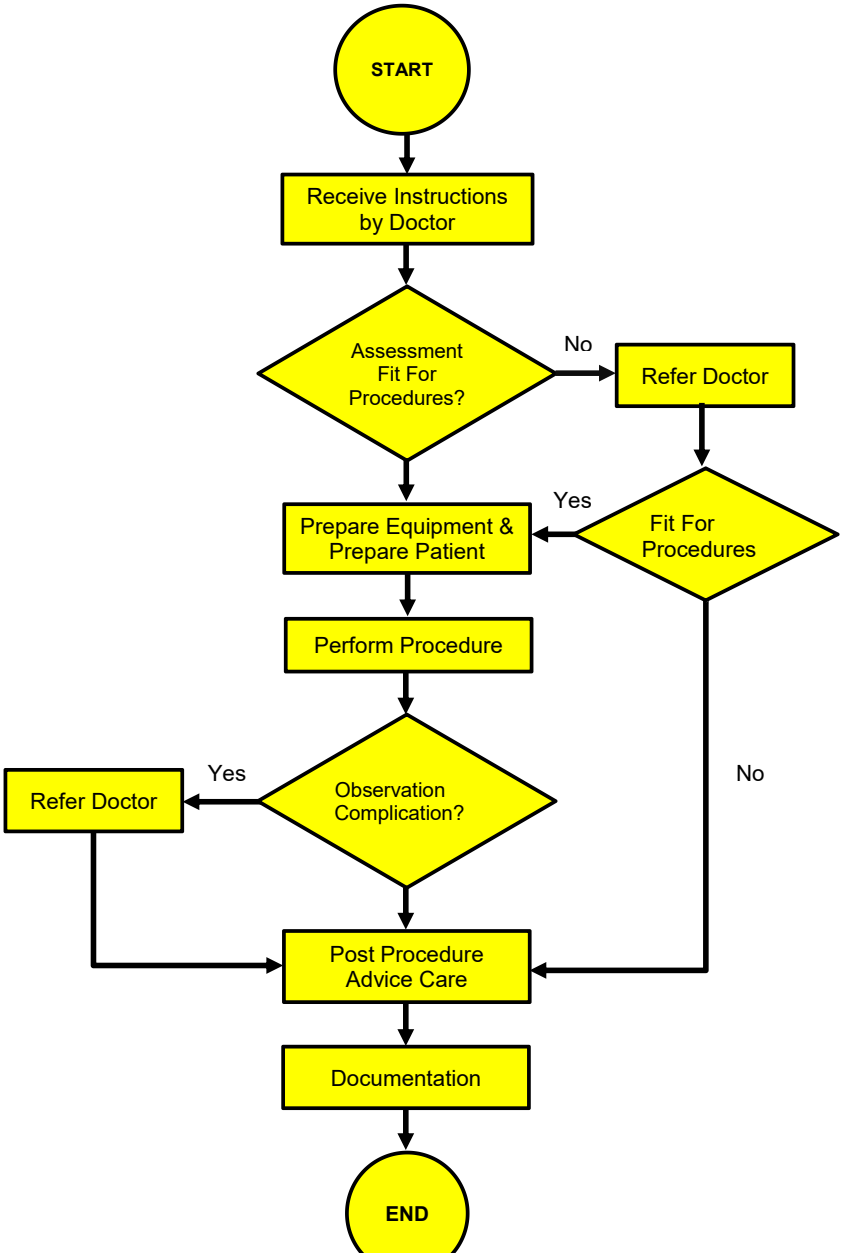
10.2. Removal of Halo Vest

Objective	Removal of Halo vest		
Indication	1. United fracture 2. Infected pin site 3. Loose pin site 4. Pre-operative		
Activity	**Work Process**	**Standard**	**Requirement**
1. Receive instructions by doctor and registration	1. Read the instructions 2. Register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Check any wound 2. Check neurological status. 3. Pain score	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Pain score scale
3. Prepare equipment and prepare patient	1. Prepare equipment 2. Check correct patient 3. Explain to patient/relative the procedure 4. Position the patient comfortably	1. Manual for Sterile Preparation KKM Second Edition 2021	**For Removal Halo Vest** 1. Torque screwdriver 2. Wrenches 3. Allen wrenches 4. Cervical ccollar 5. Dressing set
4. Perform Procedure	1. Loosen the nuts on the vest and remove the uprights 3. Subsequently, loosen the nuts on the halo ring, and use a screwdriver to loosen the pins. 4. The assistant is responsible for holding the halo ring 5. After loosening all the pins, lift the ring from the head 6. Apply a cervical collar to protect and prevent cervical movement	1. Guidelines For House Officer 2. Policies and Procedures on Infection Prevention and Control KKM thirdedition 2019	1. Personal Protection Equipment

	7. Remove the vest strapping 8. Dressing the wound at the pin site		
5. Observation	1. Pain score 2. Any wound infection 3. Refer to doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Pain score scale
6. Post procedure advice care	1. Personal hygiene 2. Care the wound 3. Advise patient to return to Orthopaedic Out-patient clinic/ Emergency Department immediately if develops: 3.1. Severe pain 3.2. Numbness / weakness 3.3. Fever 3.4. Pin Site infection		1. Health Education: LPP.ORTHO.02/ (Orthopedic Advice Slip)
7. Documentatin	1. Document the procedure		1. Procedure record system
8. Reference	1. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006) 2. *Pain The 5th Vital Sign third Edition* 3. *Policies & Procedures on Infection Prevention and Control* (KKM) 4. Babashahi, A., Author_Id, N., Rezvani, M., Vatankhah, M., Kalani, N., Kazeminezhad, A., Author_Id, N., Author_Id, N., Author_Id, N., & Author_Id, N. (2021). Complications of halo vest orthosis: a Narrative study. Iranian Journal of Neurosurgery, 7(3), 131– 138. https://doi.org/10.32598/irjns.7.3.2 5. CVA, K. (2017). https://www.medwinpublishers.com/JOBD/JOBD16000139 .pdf. Journal of Orthopedics & Bone Disorders, 1(7). https://doi.org/10.23880/jobd-16000139 6. Yang, H., Sun, Y., Wang, L., Gao, C., Yu, F., Xu, T., & Lü, X. (2021). Upper Cervical Spine Fracture-Dislocation in patients with ankylosing spondylitis: Application of halo vest before and during posterior surgery. Research Square (Research Square). https://doi.org/10.21203/rs.3.rs-557216/v1		

CHAPTER 11 : REMOVAL OF EXTERNAL FIXATION (UPPER / LOWER LIMB)

***All procedure in this chapter need more than 1 healthcare provider to perform**


START
Receive Instructions by Doctor
Assessment Fit For Procedures?
No
Refer Doctor
Fit For Procedures
Yes
Prepare Equipment & Prepare Patient
Perform Procedure
Observation Complication?
Yes
Refer Doctor
No
Post Procedure Advice Care
Documentation
END

CHAPTER 11 : WORK PROCESS REMOVAL OF EXTERNAL FIXATION (UPPER / LOWER LIMB)

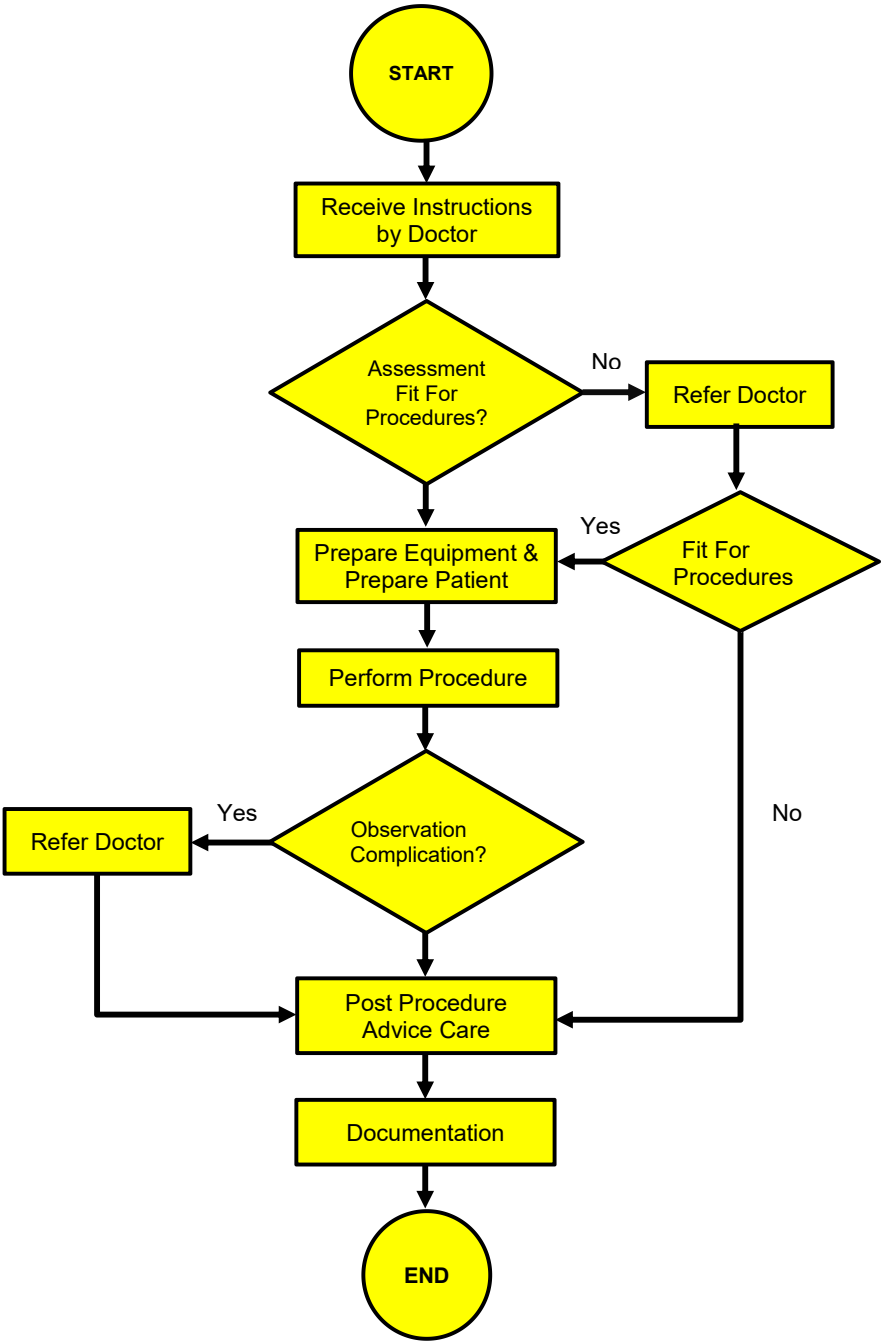
Objective	Removal of external fixation		
Indication	1. United fracture 2. Infected pin site 3. Loosed pin 4. Pre-operative		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read instruction 2. Register patient		1. Patient record system 2. Order slip
2. Assessment / Examination	1. Confirm patient 2. Check for wound 3. Check Neurovascular status, movement of the limb 4. Pain score 5. Refer doctor if any abnormalities found and patient might be not fit for the procedure 6. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Pain score scale
3. Prepare equipment and prepare patient	1. Prepare equipment 2. Explain to patient/relative the procedure 3. Position the patient comfortably 4. Place the linen protector under the injured limb		**Removal Of External Fixation** 1. POP trolley 2. Personal Protection Equipment 3. Dressing trolley 4. Allen key 5. T- Handle & Chuck key 6. Wrench 7. Plier

			8. Wire cutter 9. Scissor
4. Perform Procedure (Aseptic Technique)	1. Aseptic technique 2. Support the injured limb by holding it securely 3. Ensure proper exposure of the affected area 4. Thoroughly clean the pin site with povidone for optimal disinfection 5. Use an Allen key or wrench to loosen the elements of the external fixation device 6. Use a T-Handle to remove the Shanz Pin 7. Use pliers to pull out the wire 8. Use a wire cutter if needed 9. Dress the wound at the pin site	1. Policies and Procedures on Infection Prevention and Control KKM Third Edition 2019	1. X-ray - AP view - Lateral view 2. Personal Protection Equipment
5. Observation	1. Pain score 2. Any wound infection refer to doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Pain score scale
6. Post procedure advice care	1. Wound care 2. Encourage movement of extremities 3. Advise patient to come to Orthopaedic Out-Patient Clinic/Emergency Department immediately if develops: 3.1. Severe pain 3.2. Numbness/weakness 3.3. Fever 3.4. Pin site infection		1. Health Education: LPP.ORTHO.02/17 (Orthopedic Advice Slip)

7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. SOP for Medical Asisstant In Orthopaedic Edisi 1(2006) 2. *Pain The 5th Vital Sign third Edition* 3. *Policies & Procedures on Infection Prevention and Control* (KKM)		

CHAPTER 12 : APPLICATION OF MEDICAL DEVICE

***All procedure in this chapter need more than 1 healthcare provider to perform**


START
Receive Instructions by Doctor
Assessment Fit For Procedures?
No
Refer Doctor
Fit For Procedures
Yes
Prepare Equipment & Prepare Patient
Perform Procedure
Observation Complication?
Yes
Refer Doctor
No
Post Procedure Advice Care
Documentation
END

CHAPTER 12 : WORK PROCESS APPLICATION OF MEDICAL DEVICE

12.1. Application of Knee Continuous Passive Motion Machine

Objective	To facilitate early limb passive mobilization post surgery as to improve range of motion, blood circulation and muscle stimulation		
Indication	Early limb (knee) post surgery mobilization		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read instruction 2. Register patient		1. Patient record system
2. Assessment / Examination	1. Confirm patient 2. Confirm post op surgery/injury site 3. Check neurovascular status, movement of the limb 4. Pain score 5. Review the X-ray 6. Refer doctor if any abnormalities found and patient might be not fit for the procedure 7. If fit for procedure after seen by the doctor, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral view 2. Pain score scale
3. Prepare equipment and patient	1. Prepare equipment 2. Explain to patient/relative about the procedure 3. Confirm with patient the affected limb 4. Position the patient comfortably		1. Continuous Passive Motion Machine

4. Perform Procedure	1. Place the Continuous Passive Motion Machine at side of the limb 2. Minimum two person involved in the procedure 3. Stabilize the machine on the bed static 4. Remove a knee immobilizer or knee brace 5. Place the limb on the Continuous Passive Motion Machine leg rest with the knee joint are parallel to the Continuous Passive Motion Machine hinge arm moment to ensure appropriate knee ROM as required 6. Place the foot at the bottom by securing it against the foot pad at the bottom end 7. Secure the limb to the Continuous Passive Motion Machine by firmly strap the limb with the strap provided around thigh, shin and foot 8. At the Continuous Passive Motion Machine controller, slowly increase the Continuous Passive Motion Machine hinge angle (knee flexion) and adjust the speed accordingly as patient comfortable and pain tolerance		1. X-ray (Pre & post reduction) - AP view - Lateral view

5. Observation	1. Observe, record neurovascular status 2. Pain score 3. Refer to the doctor if any complications	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Pain Score Chart
6. Post procedure advice care	1. Wound care 2. Encourage movement of extremities 3. Advise patient to: 3.1 Ensure Continuous Passive Motion Machine controller is within reach to easily stop/adjust if required 3.2 Adjust the range of motion and speed of the Continuous Passive Motion Machine controller 3.3 Proper positioning of limb during the therapy 3.4 Inform healthcare worker for monitoring		
7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. *Cluett, J. (2023, August 28). What Is A Continuous Passive Motion (Continuous Passive Motion Machine) Machine?. What To Expect When Undergoing This Therapy.* 2. *Drugs.com. (2023, September 3). Continuous Passive Motion Machine. How Do I Use Continuous Passive Motion Machine Machine Safely. https://www.drugs.com*		

12.2. Application Of Manual Cryo Cuff

OBJECTIVE	To control inflammation at the affected area and acute post operative by mean of cold therapy		
INDICATION	1. Acute traumatic limb injury 2. Acute post operative limb surgery		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor and registration	1. Read instruction 2. Register patient		1. Patient record system 2. Order slip/Clerking Note
2. Assessment / Examination	1. Confirm patient 2. Confirm post op surgery/injury site 3. Check neurovascular status 4. Pain score 5. Refer to the doctor if any abnormalities found and patient might be not fit for the procedure 6. If the patient fit for procedure, continue to prepare equipment	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. X-ray - AP view - Lateral View 2. Pain score scale
3. Prepare equipment and patient	1. Prepare equipment 2. Confirm injury/surgery site 3. Explain to patient/relative the procedure 4. Position the patient comfortably		1. Cryo Cuff set 2. Ice cube 3. Cardiac table
4. Perform procedure	1.Apply the appropriate empty cuff to the intended limb or part 2.Secure the cuff strap firmly to ensure proper contact with the intended limb or part		

	3. Open the air valve on the cooler cover and elevate the cooler above the limb to fill the strapped cuff with chilled water 4. Place the cooler on the table above the limb level to maintain constant cuff pressure and keep it in position for 20 minutes 5. Lower the cooler below the limb to drain water from the strapped cuff back into the cooler. This will rechill the water 6. Repeat steps 4, 5, and 6 in a 20 minutes cycle 7. Refill the ice in the canister every 6 - 8 hours		
5. Observation	1. Observe, record neurovascular status 2. Pain score 3. Refer to the doctor if any complication arises	1. Pain as the 5th Vital Sign Guidelines Third Edition 2018 (KKM)	1. Pain Score Chart
6. Post procedure advice care	1. Encourage movement of extremities 2. Advise patient, don't use continuously more than 20 minutes 3. Inform attending health workers or stop using if develop complication 4. Monitor complication 4.1. Severe pain 4.2. Burning sensation 4.3. Prolong numbness 4.4. Swelling and itchiness 4.5. Cold intolerance		1. Health Education: LPP.ORTHO.02/17(Orthopedic Advice Slip)

7. Documentation	1. Document the procedure		1. Procedure record system
8. Reference	1. *How To Use Air Cast Cryo Cuff Ice Machine For Rehab. (2023, April 26). Orthobracing.https://www.orthobracing.com* 2. *Cryo/Cuff Instruction. (n.d.). Midjersey Orthopaedics Live Life Better. www.midjerseyortho.com* 3. *Knee Cold And Compression Dressing. (n.d.). Knee Cryo/Cuff. www.aircast.com*		

CHAPTER 13 : POSITIONING AND PREPARATION OF PATIENT - ORTHOPAEDIC OPERATION THEATRE.

13.1 Supine Positioning and Preparation of Patient

13.1.1 Patient for Cervical Surgery

13.1.2 Patient for Total Knee Replacement (TKR)

13.1.3 Patient for Leg Hanging Arthroscopy Surgery

13.2. Lateral Positioning and Preparation of Patient

13.2.1 Patient for Total Hip Replacement (THR)

13.2.2 Patient for Arthroscopy Shoulder Surgery

13.3. Prone Positioning and Preparation of Patient

13.3.1 Patient for Spine Surgery (Cervical / Thoracic / Lumbar)

13.4. Others Positioning and Preparation

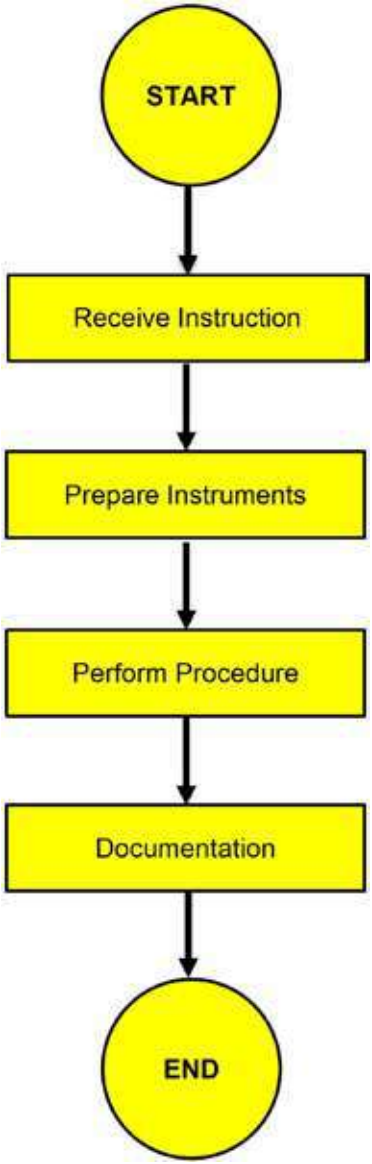
13.4.1 Beach Chair Positioning and Preparation of Patient

13.4.2. Patient on Traction Table

13.4.3 Patient for Upper Limb/Lower Limb Surgery

***All procedure in this chapter need more than 1 healthcare provider to perform**

CHAPTER 13 : FLOWCHART POSITIONING AND PREPARATION OF PATIENT - ORTHOPAEDIC OPERATION THEATRE



CHAPTER 13 : WORK PROCESS POSITIONING AND PREPARATION OF PATIENT - ORTHOPAEDIC OPERATION THEATRE.

13.1. Supine Positioning and Preparation of Patient

13.1.1. Patient for Anterior Cervical Surgery

Objective	Optimal and stable position for anterior cervical surgery		
Indication	Anterior cervical spine surgery		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive Instructions by doctor	1. Receive instruction and emphysis on surgeon preference	1. Safe Surgery Saves Live Second Edition (2018)	1. OT List 2. Patient record system
2. Prepare equipment and patient.	1. Prepare equipment for positioning 2. Position of OT table according to surgeon preference	1. Safe Surgery Saves Live Second Edition (2018)	1. OT table 2. Soft padding 3. Adhesive tape 4. Roll towels 5. Headlamp 6. Loupe 7. High Speed Burr 8. Image Intensifier (II) Machine 9. Complete spine surgery set and implant.
3. Perform procedure	**For Anterior Cervical** (Patient was under General Anesthesia (GA) on operation table and supine position) 1. Maintain the supine position 2. Place a roll towel behind the upper scapula 3. Position another towel at the back of the neck to maintain cervical lordosis 4. Secure the position with adhesive tape and secure	1. Safe Surgery Saves Live Second Edition (2018)	

	the endotracheal tube (ETT) according to the surgeon's preference 5. Expose the neck area 6. Ensure that all pressure points and bony prominences are well padded 7. Strap the upper limb to the side with adequate traction 8. Secure and fix all connectors and lines 9. Confirm with the surgeon and anesthetist that they are satisfied with the patient's, instrument, and equipment positions 10. Check the cervical alignment achieved with the Image Intensifier (II) machine		
3. Reference	1. Terrence, T. C., Jeffrey, D. F., (2016, July 28). *Cervical radiculopathy: anterior surgical approach*. https://musculoskeletalkey.com/cervicalradiculopathy-anterior-surgical-approach/ 2. Wen, X. H., Hao, X. Z., Xia, W., Hai, L., Y., & Xia, R, L. (2020). Applicationof a modified surgical position in anterior approach for total cervical artificial disc replacement. *World Journal of Clinical Cases*, 8(1), 38-45		

13.1.2 Patient for Total Knee Replacement (TKR)

Objective	Optimal and stable position for arthroplasty		
Indication	For total knee replacement surgery		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor	1. Receive instruction and emphasis on surgeon preference	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare equipment and patient	1. Confirm patient site 2. Prepare equipment for positioning 3. Expose the affected area 4. Prepare X-ray	1. Safe Surgery Saves Live Second Edition (2018)	1. OT table 2. Arm rest/support 3. Lateral support 4. Linen protector 5. Foot support 6. Half cylinder sponge (silicone/sand bag/roll towel) 7. Adhesive tape 8. Complete TKR Set and implant
3. Perform procedure	**Supine position (TKR surgery)** 1. Prepare patient in the supine position on the operation table 2. Put the patient knee in 90° flexion 3. Lock the side support on the lateral side of the thigh 4. Secure the foot support at the desired level to maintain knee flexion 5. Confirm with the surgeon and anesthetist that they are satisfied with the patient's, instrument and equipment positions	1. Safe Surgery Saves Live Second Edition (2018)	

4. Reference	1. Xia, R., Zhai, Z., Zhang, J., Degang, Y., Wang, L., Mao, Y., Zhu, Z., Wu, H., Dai, K., Yan, M., Li, H. (2021). Verification and clinical translation of a newly designed “Skywalker” robot for total knee arthroplasty: A prospective clinical study. Journal of Orthopaedic Translation, 29, 143-151, https://doi.org/10.1016/j.jot.2021.05.006. 2. Figueroa, F., Wakelin, E., Twiggs, J., Fritsch, B. (2019). The knee. ScienceDirect, 26(4), 869-875. https://doi.org/10.1016/j.knee.2019.05.004

13.1.3 Patient for Leg Hanging Arthroscopy Surgery

Objective	Optimal and stable position for arthroscopy surgery		
Indication	For knee arthroscopy surgery		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor	1. Receive instructions with emphasis on the surgeon's preferences	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare equipment and patient.	1. Confirm patient and site 2. Prepare equipment for positioning 3. Expose the affected area.	1. Safe Surgery Saves Live Second Edition (2018)	1. OT table 2. Arm rest / support 3. Lateral support 4. Linen protector 5. Leg holder 6. Drapping set 7. Arthoscopy tower and equipment
3. Perform procedure	**Supine position (Leg Hanging Surgery)** 1. Prepare operating table 2. Arrange the lateral support and leg holder 3. Add padding and use a foot pump if needed 4. Break the table with leg holder for index site and thigh supportfor contralateral site 5. Position the non-affected limb in the lithotomy position	1. Safe Surgery Saves Live Second Edition (2018)	

	6. Confirm adequate padding on both sides of the knee 7. Ensure that the legs are free and suitable for surgery 8. Verify the stability of the positioning equipment 5. Ensure the doctor is satisfied with the patient's position and alignment		
4. Reference	1. Benjamin, D. W., James, H. L. (2013). Basic knee arthroscopy part1: patient positioning. *Arthroscopy Techniques,* 2(4), 497-499		

13.2. Lateral Positioning and Preparation of Patient

13.2.1. Patient for Total Hip Replacement (THR)

Objective	Optimal and stable position for patient in lateral position		
Indication	Total hip replacement in lateral approaches		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor	1. Receive instructions with emphasis on the surgeon's preferences	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare equipment and patient.	1. Confirm patient and site 2. Prepare equipment for positioning 3. Prepare X-ray 4. Expose the affected area	1. Safe Surgery Saves Live Second Edition (2018)	1. OT table 2. Arm board 3. Arm rest/support 4. Lateral support 5. Axillary roll/Pillow 7. Patient record system
3. Perform Procedure	**Lateral position (THR Athroplasty Surgery)** 1. Position the patient laterally on the operating table 2. Rest the head on the pillow or use a head positional device 3. Support and secure the patient's arm on an arm board or armrest 4. Abduct both arms to less than 90° 5. Position the pillow at chest level 6. Flex the contralateral hip and knee	1. Safe Surgery Saves Live Second Edition (2018)	

	7. Straighten the ipsilateral leg and support it with a pillow placed between the legs 8. Apply pelvic support or iliac crease support over the ipsilateral side 9. Ensure adequate padding, especially at the shoulder, contralateral side, pelvis, knee and ankle 10. Verify that the ipsilateral axilla is free from pressure 11. Confirm the stability of the positioning equipment 12. Ensure the doctor is satisfied with the patient's position and alignment		
4. Reference	1. Megan, R., John, D., Nicholas, J. D., Janet, C. H., David, E. B., & Alex, B. L. (2018). Patient positioning and cup orientation during total hip arthroplasty-assessment of current UK practice. Sage Journal, 29(1), 89-95. 2. Steris Healthcare knowledge Centre (The Ultimate Guide Lateral Position).		

13.2.2. Patient for Arthroscopy Shoulder Surgery

Objective	Optimal and stable position for patient in lateral position		
Indication	Arthroscopy surgery requiring lateral position		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor	1. Receive instructions with emphasis on the surgeon's preferences	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare equipment and patient.	1. Confirm patient and site 2. Prepare equipment for positioning 3. Prepare X-ray 4. Expose the affected area	1. Safe Surgery Saves Live Second Edition (2018)	1. OT table 2. Arm rest / support 3. Lateral support 4. Pillow 5. Axillary roll 6. Lateral traction kit 7. Suspension device
3. Perform procedure	**Lateral position (Arthroscopy Shoulder Surgery)** 1. Position the patient laterally on the operating table 2. Apply lateral support 3. Pad bony prominences and the head 4. Apply the lateral traction kit 5. Confirm that the positioning is safe and secure positioning 6. Apply the weight as ordered by the doctor on the traction kit to maintain traction 7. Ensure the stability of the positioning equipment	1. Safe Surgery Safe Surgery Saves Live Second Edition (2018)	

	8. Confirm that the surgeon is satisfied with the patient's position and alignment		
4. Reference	1. Alexander, H. J., Sandeep, M., Johannes, F. P., Austin, V. S., & Michael T. F. (2016). Basic shoulder arthroscopy-lateral decubitus patient positioning. 5(5), 1069-1075. https://doi: 10.1016/j.eats.2016.05.010 2. Aslani, H., Bonakdar, S., Amoozade, F., Gorji, M., Gholami, M. H., Tajic, K., Morteza. (2023). The effect of lower limb position on anterior cruciate ligament reconstruction on uncommon complications after surgery. AdvancedBiomedical Research,12(1), 204https://doi.org/10.4103/abr.abr_ 34_22		

13.3. Prone Positioning and Preparation of Patient

13.3.1. Patient for Spine Surgery (Cervical / Thoracic / Lumbar)

Objective	Optimal and stable position for patient spine surgery cervical / thoracic / lumbar (posterior)		
Indication	Spine surgery		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor	1. Receive instructions with emphasis on the surgeon's preferences	1. Safe Surgery Saves Live Second Edition (2018)	1. OT List 2. Patient record system
2. Prepare equipment and patient	1. Confirm patient and site 2. Prepare equipment for positioning 3. Prepare X-ray 4. Expose the affected area	1. Safe Surgery Saves Live Second Edition (2018)	1. Consent operation **For Posterior Cervical** 1. OT table 2. Soft padding 3. Head positioner cushion/head support 4. Soft pillow 5. Shaver 6. Adhesive tape 7. Image Intensifier (II) Machine **For Posterior Thoracic and Lumbar** 1. OT table 3. Soft padding 4. Head positioner 5. Soft pillow 6. Arm board 7. Adhesive tape

3. Perform procedure	**For Posterior Thoracic and Lumbar** 1. Position the operating table as preferred by the surgeon and anesthetist 2. Set up the head positioner, choosing from options such as cushion, horse shoe, or 'O' Ring Positioner 3. Place and secure the abdominal support using a pillow, frame or poles 4. Turn the patient prone, ensuring all connections are safe and free 5. Confirm that the head and neck are in the anatomical position 6. Ensure the shoulders are abducted less than 90°, elbows are flexed, and palms are facing down 7. Ensure the abdomen is free, and use extra padding if needed 8. Apply soft padding or silicone for bony prominences 9. Flex the hip and knee, ensuring it does not exceed 90° 10. Elevate the legs with a pillow to facilitate good venous return 11. Secure the patient to maintain stability 12. Confirm that the doctor is satisfied with the patient's position and alignment 13. Check with the Image Intensifier (II) Machine		

	For Posterior Cervical 1. Strap the upper limb to the side with adequate traction 2. Shaving the hairy area 3. Strap both shoulders down and anchor them at the side of the operating table 4. Pre-clean the operation area with povidone and chlorhexidine 5. Confirm that the positioning is safe and secure **For Posterior Thoracic and Lumbar** 1. Adjust the position of the operating table 2. Set the head positioner cushion 3. Place soft padding or silicone for bony prominences 4. Elevate the legs with a pillow for good venous return 5. Ensure the abdomen is free 6. Ensure stability of the positioning equipment 7. Confirm that the doctor is satisfied with the patient's position and alignment		
4. Reference	1. AO Surgery Reference. (n.d.). Preparation posterior procedures. https://surgeryreference.aofoundation.org/spine/deformities/adolescentidiopathic-scoliosis/preparation/preparation-posterior-procedures 2. Ihab, K., & Rodger, B. (2014). Positioning patients for spine surgery-avoiding uncommon position-related complications. *World Journal ofOrthopaedic,* 5(4), 425-443. https://doi.org/10.5312/wjo.v5.i4.425		

13.4. Others Positioning and Preparation

13.4.1 Patient on Beach Chair Position

Objective	Optimal and stable position for patient in Beach Chair Position		
Indication	All surgery requiring beach chair position (shoulder surgery)		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive Instructions by doctor	1. Receive instructions with emphasis on the surgeon's preferences	1. Safe Surgery Saves Live Second Edition (2018)	1. OT List 2. Patient record system
2. Prepare equipment and patient.	1. Confirm patient and site 2. Prepare equipment for positioning 3. Prepare X-ray 4. Expose the affected are	1. Safe Surgery Saves Live Second Edition (2018)	1. OT table which can be adjusted to Beach Chair Position 2. Head positioner 3. Body strapping 4. Soft padding 5. Arthroscopy Instrument
3. Perform procedure	1. Adjust the OT table to the beach chair position 2. Ensure that all components are fitted well (headrest, arm supports, silicone, and soft padding). Put on the head positioner 3. Position the patient slightly to the side of the OT table 4. Apply the body strap 5. Apply the traction kit over the wrist 6. Ensure the proper positioning of the patient and equipment 7. Ensure the doctor is satisfied with the patient's position and alignment	1. Safe Surgery Saves Live Second Edition (2018)	

4. Reference	1. AO Surgery Reference. (n.d.). Beach chair position. https://surgeryreference.aofoundation.org/orthopedic-trauma/adulttrauma/humeral-shaft/preparation/beach-chair-position. 2. Sandeep, M., Alexander, H. J., Johannes, F. P., Austin, V. S., Christopher,J.T., & Micheal T. F. (2016). Basic shoulder arthroscopy-beach chair patient positioning. 5(4), 731-735.https://doi.org/10.1016/j.eats.2016.02.038

13.4.2 Patient on Traction Table

Objective	Optimal and stable position for lower limb surgery		
Indication	Lower limb surgeries requiring traction		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive Instructions by doctor	1. Receive instructions with emphasis on the surgeon's preferences	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare equipment and prepare patient	1. Confirm patient and site 2. Prepare equipment for positioning 3. Prepare X-ray 4. Expose the affected are	1. Safe Surgery Saves Live Second Edition (2018)	1. OT table 2. Arm board 3. Traction table equipment 3.1. Telescopic bar 3.2. Traction bar 3.3. Traction stirrup clamp 3.4. Foot plate 3.5. Screw tension device 3.6. Leg holder 3.7. Perineal post
3. Perform procedure	1. Confirm the operation site 2. Prepare the patient in the supine position on the operation table 3. Prepare the operation table and secure accordingly 4. Lower the patient slightly until the perineal area touches the perineal post 5. Hold the patient's lower limbs and	1. Safe Surgery Saves Live Second Edition (2018)	

	remove the distal part of the operating table 6. Fix the foot to the footplate of the traction table 7. Apply traction equipments 7.1 Adjust the traction accordingly 7.2 Adjust to straighten the other telescopic bar nut (limb surgery side) 8. Rest the non-affected limb on a leg holder 9. Check the fracture alignment with Imaged Intensifier (II) Machine 10. Ensure doctor satisfy with patient position and alignment		
4. Reference	1. Ramie, M., (2018). Positioning patient undergoing orthopaedic procedures. *Advances in Orthopedic Surgery, AORN Journal*, 108(1), 9-11. https://doi.org/10.1002/aorn.12278 2. Armstrong, M., & Moore R. A. (2021, November 5). Anatomy, patient positioning. StatPearls. https://www.ncbi.nlm.nih.gov/books/NBK513320/ 3. Bonnaig, N., Dailey, S., & Archdeacon, M. (2014). Proper patient positioning and complication prevention in orthopaedic surgery. *The Journal of Bone And joint Surgery*, 96(13), 1135-1140. Htpps://doi: 10.2106/JBJS.M.01267		

13.4.3 Patient for General Surgery Operation

Objective	Optimal and stable position of patient for surgery		
Indication	For upper limb / lower limb surgery		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions by doctor	1. Receive instruction	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare equipment & prepare patient.	1. Prepare equipment for positioning 2. Expose the affected area. **Chapter 13** **Work Procedure** a) Upper Limb b) Lower Limb	1. Safe Surgery Saves Live Second Edition (2018)	1. OT table 2. Upper limb - Arm board
3. Perform procedure	**Refer General Orthopaedic Operation Theatre** **(Positioning and Preparation of Patient for Upper Limb / Lower Limb Surgery)** **Chapter 13** **Work Procedure** a) Upper Limb b) Lower Limb	1. Safe Surgery Saves Live Second Edition (2018)	

Work Procedure

a) Patient For Upper Limb Surgery

Objective	Positioning and preparation of patient for upper limb surgery
Indication	All upper limb surgeries
Activity	**Work Process**
1. Prepare equipment	1. Prepare equipment for positioning. 1.1. Supine 1.2. Lateral 1.3. Prepare equipment : Arm board 1.4. Arm rest / support 1.5. OT table accessory for positioning 1.6. Lateral support 1.7. Linen protector 1.8. Pillow
2. Perform procedure	1. Confirm the operation site 2. Prepare the patient in the supine position on the operation table 3. Prepare the operation table and secure it accordingly 4. Lower the patient slightly until the perineal area touches the perineal post 5. Hold the patient's lower limbs and remove the distal part of the operating table 6. Fix the foot to the footplate of the traction table 7. Apply traction equipment

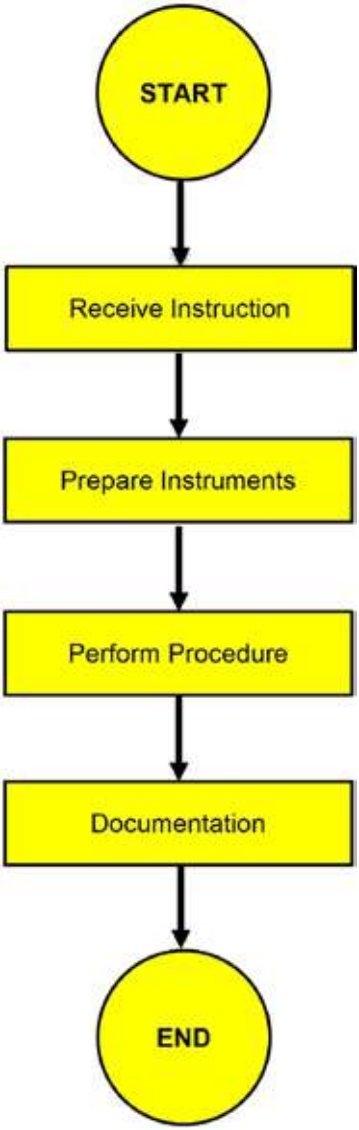
b) Patient for Lower Limb Surgery

Objective	Positioning and preparation of patient for lower limb
Indication	Lower limb surgeries
Activity	**Work Process**
1. Prepare equipment	1. Prepare equipment for positioning 1.1. Supine 1.2. Lateral 1.3. Prone 2. Prepare equipment 2.1. Arm board 2.2. Arm rest / support 2.3. Lateral support 2.4. OT Table accessory for positioning 2.5. Linen protector 2.6. Pillow 2.7. Traction kit / Suspension device if needed
2. Perform procedure	1. Obtain permission from the anesthesiologist and doctor 2. Expose the affected limb 3. Position the patient in the required position **Supine position** 1. Preparation of table 1.1. Arrange lateral support & leg holder 1.2. Padding 2. Patient Positioning 2.1. Patient in supine position after secured intubation and tube 2.2. Confirm adequate padding 2.3. Make sure leg are free and suitable for surgery **Lateral position** 1. Prepare lateral support 2. Position the patient laterally on the operating table 3. Apply padding to bony prominences and the head

	4. Place the patient in the supine position after securing intubation and the tube 4.1. Patient position in lateral decubitus 4.2. Padding of knee, head, axillar and hand 4.3. Confirm safe and secure positioning **Prone position** 1. Prepare patient in the prone position on the operation table 2. Padding of bony prominent and head 3. Patient position prone after secure intubation and tube: 3.1. Patient position in prone 3.2. Padding of knee, iliac crest, chest and head 3.3. Confirm safe and secure positioning

CHAPTER 14 : HANDLING INSTRUMENTATION FOR SURGERY

***All procedure in this chapter need more than 1 healthcare provider to perform**


START
Receive Instruction
Prepare Instruments
Perform Procedure
Documentation
END

CHAPTER 14 : WORK PROCESS HANDLING INSTRUMENTATION FOR SURGERY

14.1 Total Knee Replacement (TKR) Surgery

14.2 Total Hip Replacement (THR) Surgery

Objective	Handling instrumentation for surgery		
Indication	Handling surgical instrumentation for total knee replacement surgery and total hip replacement surgery		
Activity	**Work Process**	**Standard**	**Requirement**
1. Receive instruction by doctor	1. Receive instruction	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare instrument	1. Confirm a correct and complete instrument 2. All instrument must be prepared under sterile procedure 3. Prepare as required for the procedure	1. Manual for Sterile Preparation KKM First Edition 2010	**Total Knee Replacement Surgery** 1. Tibia/Fibula set 2. TKR set 3. Implant instrumentation set 4. Pulse lavage 5. 3 liter normal saline bag 6. Powered tools and powered saw battery operated with attachments 7. Cement bowl with spatula 8. Antibiotic cement **Total Hip Replacement Surgery** 1. Femur bone set 2. THR Set 3. Powered tools and powered saw battery operated

			with attachments 4. Implant instrumentation set 5. Antibiotic bone cement 6. Bone cement bowl with spatula 7. Cement gun 8. Pulse lavage 9. Sterile 3 liter Normal Saline
3. Perform procedure	**Refer Handling Instrumentation of Total Knee Replacement Surgery** **<u>Chapter 14</u>** **Work Procedure** **14.1 Refer Handling Instrumentation of Total Knee Replacement Surgery** **14.2 Refer Handling Instrumentation of Total Hip Replacement Surgery**	1. Safe Surgery Saves Live Second Edition (2018) 2. Manual for Sterile Preparation KKM first Edition 2010	1. X-ray / MRI 2. Personal Protection Equipment
4. Documentation	1. Ensure instrument check list complete.		1. Instrument check list
5. Reference	1. Javad Parvizi,MD: Brian Klatt, MD (2013). Essentials in Total Hip Arthroplasty. 2. www.zimmerbiomet.com 3. www.stryker.com		

CHAPTER 14 : WORK PROCEDURE HANDLING INSTRUMENTATION FOR SURGERY

14.1 Handling Instrumentation of Total Knee Replacement Surgery

Objective	Handling instrumentation for surgery
Indication	Handling instrumentation in total knee replacement surgery
Activity	**Work Process**
Perform Procedure	1. Perform surgical scrubbing and gowning techniques for the person in charge of the procedure 2. Inflate the tourniquet 3. Open the instrument sets and power tools 4. Prepare the skin incision instrument 5. Set up the instrument for distal femoral cutting 6. Set up the battery-operated power tool and power saw 7. Prepare the extra medullary proximal tibia jig 8. Prepare the extension gap tool and alignment rod 9. Prepare the femoral sizing jig 10. Prepare the chamfers cutting jig 11. Prepare the notch cutting block 12. Prepare for the TKR component trial 13. Prepare the tibial jig and finish tibia preparation 14. Prepare pulse lavage and 3 liter normal saline bag for washout 15. Mix the antibiotic bone cement in plastic bowl and set the timing 16. Confirm the correct implant size before providing it to the surgeon 17. Unboxing the desired sterile TKR implant 18. Prepare the cement removal tool during implantation 19. Remind the surgeon when the cement setting time is complete 20. Prepare for final washout 21. Prepare for skin closure 22. Inform the surgeon that the swab count is correct 23. Unscrub and transfer the instrument to cleaning room 24. Release the tourniquet pressure upon completion of suturing 25. Make sure all used instruments are complete 26. Clean and rearrange the instrumentation and set before repackaging and sterilizing process

Reference	1. Richard D.Scott. (2019). Total Knee Arthroplasty, third Edition. Harvard Medical School, Boston. 2. www.zimmerbiomet.com 3. www.stryker.com

14.2 Handling Instrumentation of Total Hip Replacement Surgery

Objective	Handling instrumentation for surgery
Indication	Handling instrumentation of total hip replacement surgery
Activity	**Work Process**
Perform Procedure	1. Perform surgical scrubbing and gowning after preparing all the required instruments, sets, and implants in the operating theater 2. Assemble the open basic arthroplasty set, implant instrumentation sets, battery-operated power saw, and tools along with supplementary instruments while the surgeon exposes and explores the surgical site **Acetabular Preparation and Implantation.** 1. Prepare battery-operated surgical saw 2. Prepare spherical reamers. Attach the smallest size available to the power tool with reamer attachments 3. For cementless procedures, assemble the appropriate cup trial of the same diameter as the final reamer size 4. For cemented procedures, assemble the trial cup on the cup introducer 5. Prepare pulse lavage for washout to clean thoroughly the interstices of the trabecular bone of bone debris, marrow and fat 6. Facilitate the surgeon in cleaning and drying the acetabulum and ensuring gauze counts are correct as dry gauze swabs are packed into the acetabulum 7. For cementless implant, facilitate the attachment of the implant cup to the introducer and provide it to the surgeon with a mallet 8. Prepare the drill bit for multiple fixation holes to facilitate the drilling process 9. Once the cup is fixed, facilitate the provision of the liner implant and liner impactor to the surgeon with a mallet 10. If cemented implant, facilitate the preparation for Bone Cement mixing and start mixing the powder and solution once the implant is prepared and the surgeon has given the instruction. 11. Monitor the cement mixing process 12. Prepare for cement pressurization using an acetabular pressurizer on a handle 13. Prepare for cup implantation using a Lateral Cup Introducer, and an Axial Cup Pusher with a head diameter corresponding to the cup is used to drive the cup into a stable seated position

Femoral Preparation and Implantation.

1. Prepare the box chisel for medullary canal opening
2. Prepare femoral reamers
3. Prepare femoral broaching from a smaller size broach until anticipated for the final size
4. Prepare trial femoral neck and head for pre-implantation trials
5. Facilitate the surgeon in reducing the hip and making adjustments to the leg length and implant offset
6. Prepare for femoral canal washout and assist in the process
7. For cementless implant, attach the femoral implant to the introducer hand and provide it to the surgeon
8. For cemented implant, facilitate the preparation of the appropriate intramedullary plug and mark the introducer with the same markings proximally as the broach and femoral stem
9. Facilitate the preparation for cementing and implantation of the femoral stem implant. The correct cementing technique involves retrograde injection of cement using a cement gun, followed by vigorous pressurization using a proximal seal fitted to the nozzle of the cement gun
10. Mixing of bone cement when instructed by the surgeon and time the process
11. Facilitate the surgeon during cement injection and pressurization
12. Attach the centralizer to the tip of the femoral stem implant
13. Ensure that the stem does not dislodge during cement polymerization. When the cement has fully set, assist the surgeon in removing excess cement
14. Facilitate the preparation for trial reduction using the appropriate trial head to confirm that the leg length and offset have been restored and the hip is stable through a full range of movement
15. Facilitate the preparation for the implantation of the head using an impactor and mallet
16. Assist in hip reduction
17. Prepare for lavage washout and the closure of soft tissues and skin
18. Seek permission from the surgeon to unscrub for washing and cleaning all sets and instruments, and rearrange all sets and instruments that were used
19. Ensure that all used instruments are complete

	20. Notify the surgeon of any defects or compromised handling and packaging of implants 21. Clean and organize the instrumentation and set before repackaging and sterilizing process

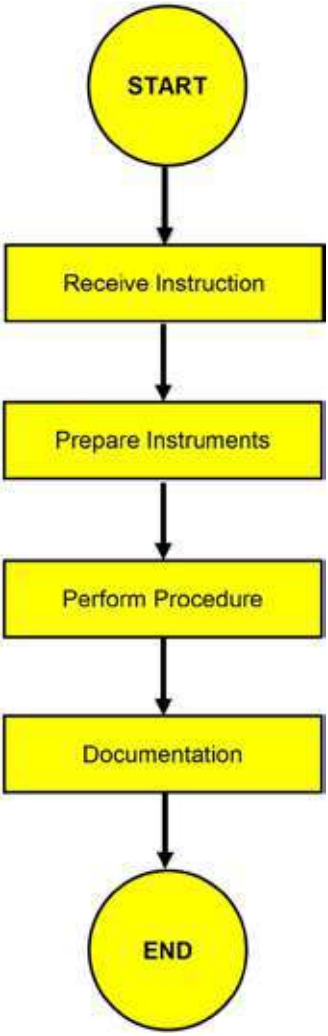
CHAPTER 15 : HANDLING INSTRUMENTATION FOR MEDICAL DEVICE IN SURGERY

15.1. Application of Torniquet in Operation Theatre

15.2. Preparation of Arthroscopy System

15.3. Preparation of Microscope System

***All procedure in this chapter need more than 1 healthcare provider to perform**


START
Receive Instruction
Prepare Instruments
Perform Procedure
Documentation
END

CHAPTER 15: WORK PROCESS HANDLING INSTRUMENTATION FOR MEDICALDEVICE IN SURGERY

15.1 Application of Tourniquet

Objective	Control venous and arterial circulation to an extremity for a period of time		
Indication	To reduce bleeding in upper and lower limb surgeries		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions order by doctor and registration	1. Check patient according to check list	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare equipment and patient	1. Torniquet functioning well 2. Verify that the cuff tourniquet is the appropriate size 3. Verify that there are no leaks 4. Correct limb & correct site 5. Apply orthoban first followed by tourniquet cuff 6. Fix the cuff with cotton bandage 7. Do not inflate, deflate until ordered by the doctor		1. Tourniquet machine 2. Orthoban 3. Cotton bandage
3. Perform procedure	1. Tourniquet in place 2. Does not slip (apply adhesive plaster if necessary) 3. Verify the correct limb, size, and site, ensuring it does not obstruct the surgical field 4. Follow the surgeon's instruction to inflate the tourniquet 5. Announce - tourniquet applied and timing	1. Safe Surgery Saves Live Second Edition (2018)	

	initiated 6. Tourniquet pressure for the adult are : 6.1. 50mmHg above thepatient's systolic blood pressure for upper extremities 6.2. 100mmHg above the patient's systolic blood pressure for lower extremities. The inflation time of the cuff should be minimized as much as possible 7. Off equipment 7.1. Wait for surgeons Instruction 7.2. Release slowly to avoid sudden gush of blood		
4. Documentation	1. Record tourniquet time and pressure in patient record system	1. Safe Surgery Saves Live Second Edition (2018)	1. Patient record system
5. Reference	1. *Spruce, L. (2017). Back to basics: pneumatic tourniquet use. AORN Journal. 106(3), 219-226.* 2. *Yelena, B., & David, L. (2017). Use of tourniquets in limb trauma surgery. 49(2), 157-165. ScienceDirect.* 3. *Association of PeriOperative Registered Nurses. (2022, March 15). Care of patients undergoing pneumatic touniquet-assisted procedures.*		

15.2 Preparation of Arthroscopy System

Objective	Preparation for all arthroscopy surgery		
Indication	For knee, shoulder, ankle and hip arthroscopy procedure		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions order by doctor and registration	1. Received instruction 2. Check patient according to check list	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare equipment	1. Prepare equipment (Arthroscopy System) 2. Prepare and check function each of individual component	1. Safe Surgery Saves Live Second Edition (2018)) 2. Manual for Sterile Preparation KKM Second Edition 2021 3. Procedures on Infection Prevention and Control KKM Third Edition 2019	1. Telescope 2. Console 3. Light source 4. Camera head 5. Handpiece shaver/burr 6. Ablator 7. Arthroscopy pump machine 8. Sterile microscope cover 9. Recording system 10. Display monitor 11. Foot paddle 12. Fluid management
3. Perform procedure	1. Move the arthroscopy system to the OT room 2. Park the machine at suitable area 3. Switch 'ON' the system 4. Enter particular patient in the system 5. Telescope, handpiece shaver, camera head and light source is	1. Safe Surgery Saves Live Second Edition (2018) 2. Policies and Procedures on Infection Prevention and Control KKM Third Edition 2019	

	sterile 6. Connect all cable to the console 7. Switch 'OFF' the device after used 8. Return the system at the designated place		
4. Documentation	1. Save data (image & video) in software system 2. Print selected image 3. Export data for backup		1. Patient record system
5. Reference	*1. https://www.shshrek.com* *2. Arthroscopic Equipment and Set Up for Wrist Arthroscopy pp 579–584* *3. Richmand, J. C., Bono, J. V., & McKeon, B. P. (2009). Knee Arthroscopy* *4. Schena, A., & Ross. G., (2009). Knee Arthroscopy: Technique and Normal Anatomy*		

15.3 Preparation of Microscope System

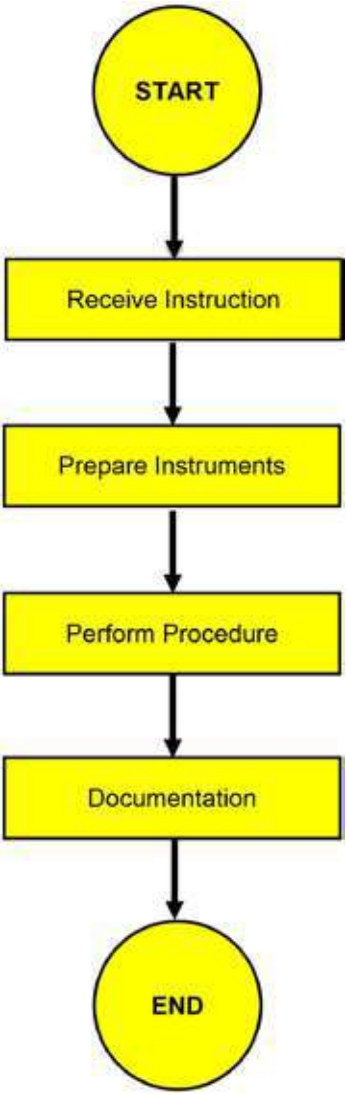
Objective	Surgical treatment for microsurgery patient		
Indication	For surgeon use during microsurgery		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instructions and registration	1. Receive instruction from Surgeon 2. Enter patient detail in system	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare equipment	1. Prepare equipment (Microscope) 2. Test to ensure machine and monitor is functional and in good condition		1. Microscope 2. Sterile microscope cover
3. Perform procedure	1. Move the microscope and monitor screen to the OT room 2. Park the machine at suitable area 3. Make sure monitor visible to everyone 4. Switch 'ON' the microscope machine and screen 5. Adjust the Ocular Lens desired focus for surgeon as requested 6. Cover the both handle with standard sterile cover 7. Pull carefully the microscope and screen monitor when surgeon are ready to use the machine 8. Remove the microscope and screen monitor from the operation area after surgery	1. Safe Surgery Saves Live Second Edition (2018) 2. Manual for Sterile Preparation KKM First Edition 2010 3. Policies and Procedures on Infection Prevention and Control KKM Third Edition 2019	

	8. Switch 'OFF' the microscope machine and screen 9. Place the microscope and screen monitor back to the designated storage area		
4. Documentation	1. Save data and export data for backup		1. Procedure record system
5. Reference	*1. https://www.olympus-lifescience.com/en/microscope-resource/primer/anatomy/objectivereferences/* *2. The operating microscope. II. Individual parts, handling, assembling, focusing, and balancing. https://doi.org/10.1002/micr.1920010603*		

CHAPTER 16 : GRAFT PREPARATION

***This procedure in this chapter need more than 1 healthcare provider to perform**

CHAPTER 16 : FLOWCHART GRAFT PREPARATION AS ORDERED BY DOCTOR



CHAPTER 16 : WORK PROCESS GRAFT PREPARATION

OBJECTIVE	To prepare soft tissue graft in a safe and sterile condition		
INDICATION	Surgery requiring soft tissue autograft and allograft		
Activity	**Work Process**	**Standard**	**Requirements**
1. Receive instruction by doctor	1. Receive instruction	1. Safe Surgery Saves Live Second Edition (2018)	1. OT list 2. Patient record system
2. Prepare instrument	Autograft and Allograft: 1. Confirm size and length 2. Confirm type of graft 3. Come with sterile packaging in cold chain with - 0° C and thermometer inside. (NATIONAL TISSUE BANK SOP) 4. Observe sterile technique at all time 5. Cold storage box	1. Manual for Sterile Preparation KKM First Edition 2010	1. Graff Master set 2. Tendon stripper 3. Multifilament braided suture 4. Mayo scissors 5. Kocher's forcep 6. Mallet 7. Needle holder 8. Power drill 9. Power saw 10. Scalpel blade 11. McDonald dissector 12. Straight scissors 13. Bone nibbler/ Rounger
3. Perform procedure	**AUTOGRAFT** **Hamstring & Quadriceps** 1. Receive the graft from the surgeon 2. Clear the tissue muscle around the graft with a MacDonald dissector 3. Measure the diameter and length of the graft 4. Combine the graft to	1. Safe Surgery Saves Live Second Edition (2018) 2. Policies and Procedures on Infection Prevention and Control KKM Third Edition 2019	

	achieve the appropriate size and optimal length, following the surgeon's instructions or as directed 5. Suture the graft with polyester suture (non absorbable suture) size 2 6. Tension the graft with 10 to 15 pounds for proper stretching 7. Soak the graft in 2 vials of vancomycin or gentamycin (80mg in 10cc normal saline) with gauze wrapped around it for 15 - 20 minutes 8. Pass the graft to surgeon when ready **ALLOGRAFT** 1. Make sure the allograft is received in sterile packaging 2. Open the packaging and take some pieces of tissue, bone, and swab for culture and sensitivity (C&S) 3. Soak the graft in 2 vials of vancomycin or gentamycin (80mg in 10cc normal saline) with gauze wrapped around it for 15 - 20 minutes 4. Prepare the graft with the diameter and length according to the surgeon's instructions 5. Suture the graft with polyester suture (non absorbable suture) size 5 6. Tension the graft at 15 to 20 pounds		

	7. Pass the graft to surgeon when ready		
4. Documentation	1. Document the procedure in procedure record system (size, diameter and length allograft)		1. Patient record system

1. LIST OF EQUIPMENT IN POP TROLEY

1. Plaster Of Paris (POP) (Size 10cm, 15cm, 20cm)
2. Orthoban (Size 7.5cm, 15cm)
3. Crepe / Cotton bandage (Size 5cm, 7.5cm, 10cm)
4. Arm sling
5. POP scissor
6. Shear bruns scissor
7. Wolf plaster breaker
8. Lorenz plaster shear
9. Henning plaster spreader
10. Daw's plaster spreader
11. Electric cast cutter

2. LIST OF EQUIPMENT IN ORTHOPEDIC PROCEDURE

1. Collar and cuff
2. Adhesive plaster
3. Utility scissor
4. Lister scissor
5. Allen key
6. T handle & chuck key
7. Plier
8. Wire cutter
9. Scissor
10. Marker
11. Goniometer
12. Spacer block
13. Limb support
14. Wrench (variable size)
15. Basic Dressing Set

LPP.ORTHO.01/17

BORANG SENARAI SEMAK PROSEDUR CMR DAN PEMASANGAN POP

JABATAN ORTOPEDIK HOSPITAL _____
SENARAI SEMAK PROSEDUR CMR DAN PEMASANGAN POP

Nama Pesakit : Tarikh :
MRN / RN / IC Pesakit : Bangsa : M / C / I / Lain-lain
Umur : Jantina : L / P

BIL	ARAHAN	YA	TIDAK	ULASAN / CATATAN
1	Arahan bertulis dari Doktor			
2	Kelainan pesakit			
3	Semak butiran pesakit :			
	a. Nama yang betul			
	b. No pendaftaran / Kad pengenalan/ MRN			
	c. Punca rujukan pesakit			
	d. Filem Xray yang betul			
4	Penerangan kepada pesakit tentang prosedur yang dilakukan			
5	Penilaian Tahap Kesakitan			0 1 2 3 4 5 6 7 8 9 10
6	Pengesahan dengan pesakit bahagian anggota yang terlibat untuk pemasangan kast			
7	Status peredaran darah :			
	a. Bengkak			
	b. Nadi			
	c. Warna Jejari (sila bulatkan) : Pink / Pale / Black (Gangrene)			
8	Status neurologi :			
	a. Kebas (sensori)			
	b. Pergerakan (motor)			
9	Keadaan Kulit :			
	a. Blister			
	b. Abrasion wound			
	c. Puncture wound			
	d. Laceration wound			
	e. Alahanisilergi			
10	Barang aksesori di anggota pesakit (Cth. Cincin / Gelang)			
11	Pemberian Slip penjagaan POP			
12	Pendidikan Kesihatan Kepada Pesakit			
13	Jenis POP yang telah dipasang : POP / Fibre Glass			

OBSERVATION CHART (CMR UNDER SEDATION)

CMR	TIME	B/P	PULSE	SPO2	REMARKS
PRE					
POST					

Sedation : 1. _____ Dosa 2. _____ Dose

Given by : Dr _____ Time : _____ AM / PM

Penolong Pegawai Perubatan

T/T Pegawai : Tarikh :
Nama & Cop : Masa :

LPP.ORTHO.02/17

BORANG ARAHAN PROSEDUR ORTOPEDIK

JABATAN ORTOPEDIK HOSPITAL .....

BORANG ARAHAN PROSEDUR ORTOPEDIK

NAMA	:			TARIKH		
NO.PENDAFTARAN	:			KLINIK /A&E /JPL		
DIAGNOSIS	:					
ANGGOTA TERLIBAT	: KIRI / KANAN		BAHAN : POP / FIBREGLASS			
JENIS POP/BACKSLAB	: BELOW ELBOW	☐	ABOVE ELBOW	☐	HANGING CAST	☐
	BELOW KNEE	☐	ABOVE KNEE	☐	SCAPOID CAST	☐
	PTB	☐	CYLINDER	☐	BENNET CAST	☐
	BOOT	☐	BODY CAST	☐	GUTTER SPLINT	☐
	VOLAR	☐	U-SLAB	☐	THUMB SPICA	☐
OFF	: POP / BACKSLAB	☐	K-WIRE	☐	EXTERNAL FIXATOR	☐
LAIN- LAIN :	.....					
CMR :	.....					
	DRESSING	☐	STO	☐	WOUND INSPECTION	☐

DI ARAHKAN OLEH PEGAWAI PERUBATAN

.....

(COP)

ADVICE FOR PATIENT WHO HAD UNDERGONE APPLICATION OF PLASTER

Health Education :

1. Encourage movement of extremities
2. Do not attempt to dry heat
3. Do not get plaster wet
4. Do not cut or change the shape of the plaster
5. Do not scratch skin or introduce foreign object into the plaster
6. Do not bear weight on plaster unless you have been told other wise
7. Advice care of wound – if indicated

Advise patient to return to Orthopedic Clinic / Emergency Department immediately if complication develops :

1. Swelling
2. Severe pain
3. Numbness
4. Change in colour of extremities
5. Broken Plaster of Paris
6. Fever
7. Four smell

STANDARD PRACTICE GUIDELINES

Assistant Medical Officers Services Section
Ministry Of Health, Malaysia

e ISBN 978-967-18696-7-3

STANDARD PRACTICE GUIDELINES