CHAPTER 1

Normal Values and Assessments

ASIA Classification of Spinal Cord Injury

- The American Spinal Injury Association (ASIA) has developed a spinal injury classification system based on specific motor and sensory assessments as depicted in the figure on page 2.
- Motor function is determined by manual muscle testing of 10 key muscles. Results of manual muscle tests are expressed numerically.
- Dermatomal sensation assessment for pinprick and light touch is performed and scored numerically.
- The ASIA Impairment Scale, using letters A to E, represents the overall classification of the spinal injury.

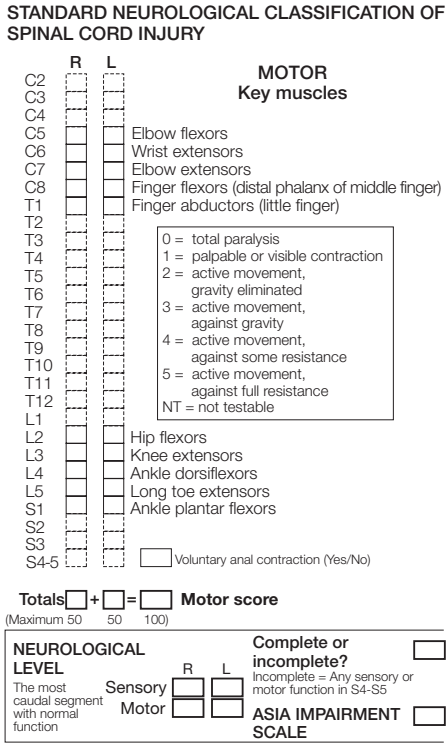

Figure 1.1 Standard Neurological Classification of Spinal Cord Injury

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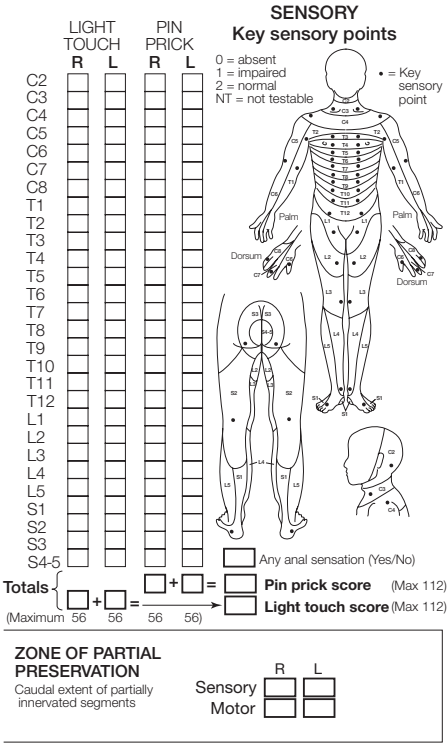

Figure 1.1 *continued*

- ☐ **A = Complete:** No motor or sensory function is preserved in the sacral segments S4–S5.
- ☐ **B = Incomplete:** Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4–S5.
- ☐ **C = Incomplete:** Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3.
- ☐ **D = Incomplete:** Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.
- ☐ **E = Normal:** Motor and sensory function are normal.

Clinical Syndromes

- ☐ Central Cord
- ☐ Brown-Séquard
- ☐ Anterior Cord
- ☐ Conus Medullaris
- ☐ Cauda Equina

Figure 1.2 ASIA Impairment Scale

Source: Reproduced with permission of the American Spinal Injury Association (2005).

Table 1.1 Blood—Complete Blood Count (CBC)

Note: Normal values may vary from one laboratory to another. The values presented in these charts should not be considered absolute.

Assessment Component	Values	Description/Implications/Red Flag Values
Red Blood Cells (RBCs) (erythrocytes)	Infants: 5.5–6.0 million/mm^3 Children: 4.6–4.8 million/mm^3 Men: 4.5–5.3 million/mm^3 Women: 4.1–5.1 million/mm^3	Individuals with lower-than-normal values have anemia. Anemia symptoms: fatigue, weakness, SOB, dizziness, tachycardia Individuals with higher-than-normal values have polycythemia. Polycythemia symptoms: SOB, headache, dizziness, itchiness.
Erythrocyte Sedimentation Rate (ESR/Sed. Rate)	Children: 1–13 mm/h Men: 0–17 mm/h Women: 1–25 mm/h	The ESR is the rate at which erythrocytes settle out of blood plasma in 1 hour. A high rate is indicative of infection or inflammation
Hematocrit (HCT)	Infants: 30–60% Children: 30–49% Men: 37–49% Women: 36–46%	Hematocrit is the percent of whole blood composed of erythrocytes. Exercise may be restricted at values of ≤25%.

continues

Table 1.1 Blood—Complete Blood Count (CBC), *continued*

Note: Normal values may vary from one laboratory to another. The values presented in these charts should not be considered absolute.

Assessment Component	Values	Description/Implications/Red Flag Values
Hemoglobin (HGB)	Infants: 17–19 g/dL Children: 14–17 g/dL Men: 13–18 g/dL Women: 12–16 g/dL	HGB measures the oxygen-carrying capacity of RBCs. Low values between 8 and 10 g/dL are associated with poor exercise tolerance, increased fatigue, and tachycardia.
Platelets	Units: cells/mm^3 Infants: 200,000–475,000 Children: 150,000–400,000 Adults: 150,000–400,000	Platelets play a key role in the initiation of the clotting process within damaged blood vessels. Exercise may be cautiously performed with values of 21,000–50,000 cells/mm^3. Exercise may be contraindicated at values of $\leq$20,000 cells/mm^3.
White Blood Cells (WBCs)	Units: cells/mm^3 Children: 4,500–14,500 Adults: 4,500–11,000	White blood cells play a crucial role in the body's immune reaction. Exercise may not be permitted at values of $\leq$5,000 cells/mm^3.

Differential WBC Count	**Neutrophils:** 1,800–7,000 cells/mm^3 **Lymphocytes:** 1,500–4,000 cells/mm^3 **Monocytes:** 0–800 cells/mm^3 **Eosinophils:** 0–450 cells/mm^3 **Basophils:** 0–200 cells/mm^3	The various white blood cells play different roles in the immune process. They exist in stereotypical proportions.

Table 1.2 Blood—Electrolytes

Note: Normal values may vary from one laboratory to another. The values presented in these charts should not be considered absolute.

Assessment Component	Values	Description/Implications/Red Flag Values
Potassium	Children: 3.5–5.5 mEq/L Adults: 3.5–5.3 mEq/L	Hypokalemia: dizziness, muscle weakness, fatigue, leg cramps Hyperkalemia: muscle weakness, flaccid paralysis, paresthesias
Sodium	135–145 mEq/L	Hyponatremia: muscle twitching, weakness Hypernatremia: fever, convulsions
Chloride	Children: 98–105 mEq/L Adults: 95–105 mEq/L	Chloride shifts are most often associated with shifts in sodium.
Calcium	Children: 9–11.5 mg/dL Adults: 9–11 mg/dL	Hypocalcemia: paresthesias, muscle spasms Hypercalcemia: lethargy, muscle weakness, flaccidity, bone pain
Magnesium	Children: 1.6–2.6 mEq/L Adults: 1.5–2.5 mEq/L	Hypomagnesemia: muscle cramping, tetany, confusion Hypermagnesemia: decreased reflexes, muscle weakness, lethargy

Table 1.3 Blood—Prothrombin Time

Note: Normal values may vary from one laboratory to another. The values presented in these charts should not be considered absolute.

Assessment Component	Values	Description/Implications/Red Flag Values
Prothrombin Time (PT)	12–15 sec	This assessment measures the clotting ability of blood.
Partial Prothrombin Time (PTT)	30–40 sec	Measures of 1.5 to 2.5 times the reference range are considered therapeutic. Physical therapy may be contraindicated at values of ≥2.5 times the reference range in individuals not taking anticoagulants and values of ≥2.5–3.0 times the reference range for those taking anticoagulant medications.

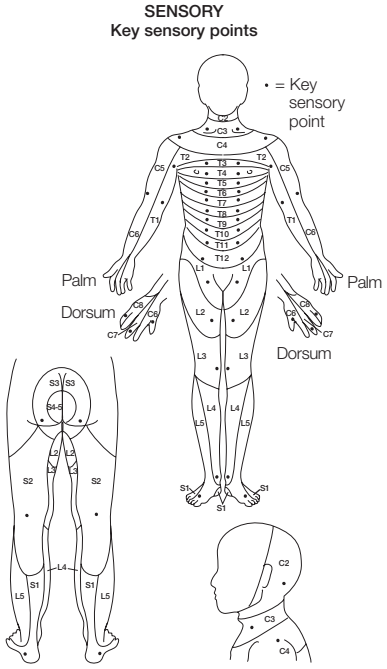

Figure 1.3 Key Sensory Points

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Table 1.4 Range of Motion—Lower Extremity and Spine

Note: Values are according to the American Academy of Orthopedic Surgeons.

Joint	Hip	Range of Motion (in degrees)
Hip	Flexion	0–120
	Extension	0–30
	Adduction	0–30
	Abduction	0–45
	Lateral rotation	0–45
	Medial rotation	0–45
Knee	Flexion	0–150
Ankle	Dorsiflexion	0–20
	Plantar flexion	0–50
	Inversion	0–35
	Eversion	0–15
Cervical	Flexion	0–45
	Extension	0–45
	Rotation	0–60
	Lateral flexion	0–45
Thoracolumbar	Flexion	0–80
	Extension	0–25
	Rotation	0–35
	Lateral flexion	0–45

Range of Motion—Lower Extremity Percentages

In some instances, it may be preferable to report measured range of motion as a percentage of normal values. This may be especially true when setting or interpreting long- and short-term goals and for reporting to third-party payers or nonphysical therapy personnel. The chart on page 16 provides percentage approximations in 5% intervals. An approximate percentage can be determined by choosing the number from the chart that is closest to the measured joint range (e.g., 95° of knee flexion represents an approximate 30% deficit).

Table 1.5 Range of Motion—Lower Extremity Percentages																				
% of Normal	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5
% of Deficit	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Hip *flex.*	120	114	108	102	96	90	84	78	72	66	60	54	48	42	36	30	24	18	12	6
Abd.	45	32	41	38	36	34	32	29	27	25	23	20	18	16	14	11	9	7	5	2
Add.	30	29	27	26	24	23	21	20	18	17	15	14	12	11	9	8	6	5	3	2
Ext. rot.	45	42	41	38	36	34	32	29	27	25	23	20	18	16	14	11	9	7	5	2
Int. rot.	45	42	41	38	36	34	32	29	27	25	23	20	18	16	14	11	9	7	5	2
Ext.	30	29	27	26	24	23	21	20	18	17	15	14	12	11	9	8	6	5	3	2
Knee *flex.*	150	143	135	128	120	113	105	98	90	83	75	68	60	53	45	38	30	23	15	8
Ankle *dorsi.*	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Plantar	50	48	45	43	40	38	35	33	30	28	25	23	20	18	15	13	10	8	5	3
Invers.	35	33	32	30	28	26	25	23	21	19	18	16	14	12	11	9	7	5	4	2
Evers.	15	14	14	13	12	11	11	10	9	8	8	7	6	5	5	4	3	2	2	1

Table 1.6 Range of Motion—Upper Extremity

Note: Values are according to the American Academy of Orthopedic Surgeons.

Joint	Motion	Range of Motion (in degrees)
Shoulder	Flexion	0–180
	Extension	0–60
	Abduction	0–180
	Lateral rotation	0–90
	Medial rotation	0–70
Elbow Complex	Flexion	0–150
	Pronation	0–80
	Supination	0–80
Wrist	Flexion	0–80
	Extension	0–70
	Radial deviation	0–20
	Ulnar deviation	0–30
Thumb	CMC flexion	0–15
	CMC extension	0–20
	CMC abduction	0–70
	MCP flexion	0–50
	IP flexion	0–80
2nd through 5th digits	MCP flexion	0–90
	MCP hyperextension	0–45
	MCP abduction	0–45
	PIP flexion	0–100
	DIP flexion	0–90
	DIP hyperextension	0–10

CMC=carpometacarpal; DIP=interphalangeal distal; IP=interphalangeal; MCP=metacarpophalangeal; PIP=posterior interphalangeal.

Table 1.7 Range of Motion—Upper Extremity Percentages

(See rationale and use instructions on page 15.)

% of Normal	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5
% of Deficit	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Shoulder *abd.*	180	171	162	153	144	135	126	117	108	99	90	81	72	63	54	45	36	27	18	9
Flexion	180	171	162	153	144	135	126	117	108	99	90	81	72	63	54	45	36	27	18	9
Ext. rot.	90	86	81	77	72	68	63	59	54	50	45	41	36	32	27	23	18	14	9	5
Int. rot.	70	67	63	60	56	53	49	46	42	39	35	32	28	25	21	18	14	11	7	4
Extension	60	57	54	51	48	45	42	39	36	33	30	27	24	21	18	15	12	9	6	3
Elbow *flex.*	150	143	135	128	120	113	105	98	90	83	75	68	60	53	45	38	30	23	15	8
Pron./Supin.	80	76	72	68	64	60	56	52	48	44	40	36	32	28	24	20	17	12	8	4
Wrist *flexion*	80	76	72	68	64	60	56	52	48	44	40	36	32	28	24	20	17	12	8	4
Ext.	70	67	63	60	56	53	49	46	42	39	35	32	28	25	21	18	14	11	7	4
Rad. dev.	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Uln. dev.	30	29	27	26	24	23	21	29	18	17	15	14	12	11	9	8	6	5	3	2

Thumb																								
CMC flex.	15	14	14	13	12	11	11	10	9	8	8	7	6	5	5	4	3	2	2	1
CMC ext.	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
CMC abd.	70	67	63	60	56	53	49	46	42	39	35	32	28	25	21	18	14	11	7	4
MCP flex.	50	48	45	43	40	38	35	33	30	28	25	23	20	18	15	13	10	8	5	3
IP flex.	80	76	72	68	64	60	56	52	48	44	40	36	32	28	24	20	17	12	8	4
Digits 2-5																				
MCP flex.	90	86	81	77	72	68	63	59	54	50	45	41	36	32	27	23	18	14	9	5
MCP hypex.	45	43	41	38	36	34	32	29	27	25	23	20	18	16	14	11	9	7	5	2
MCP abd.	45	43	41	38	36	34	32	29	27	25	23	20	18	16	14	11	9	7	5	2
PIP flex.	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5
DIP flex.	90	86	81	77	72	68	63	59	54	50	45	41	36	32	27	23	18	14	9	5
DIP hypetxt.	10	9	9	9	8	8	7	7	6	6	5	5	4	4	3	3	2	2	1	1

Table 1.8 Manual Muscle Testing—Hip and Knee

Joint	Motion	Muscle(s)	Gravity+ Fair	Gravity− Poor
Hip	Flexion	Iliopsoas Rectus femoris Pectineus Tensor fas. latae Sartorius	Sitting	Side lying
	Extension	Gluteus maximus Hamstrings	Prone Prone	Side lying
	Abduction	Gluteus medius Gluteus minimus	Side lying	Supine
	Adduction	Adductor longus Adductor brevis Adductor magnus Gracilis Pectineus	Side lying	Supine
	Lateral rot.	Piriformis Gemellus sup./inf. Obturator ext./int. Quadratus fem. Gluteus maximus	Sitting	Supine
	Medial rot.	Gluteus minimus Gluteus medius Tensor fas. lat.	Sitting	Supine
Knee	Extension	Quadriceps	Sitting	Side lying
	Flexion	Hamstrings Gastrocnemius	Prone	Side lying

Table 1.9 Manual Muscle Testing—Ankle

Joint	Motion	Muscle(s)	Gravity+ Fair	Gravity– Poor
Ankle	Dorsiflexion	Tibialis anterior Peroneus tertius Ext. digit long. Ext. hal. long.	Sitting	Sitting
	Plantar flexion	Gastrocnemius Soleus	Standing	Prone
	Plantar flexion	Soleus	Standing (with knee flexion)	Prone (with 90° knee flexion)
	Inversion	Tibialis posterior Tibialis anterior Flex. digit. long. Flex. hal. long. Ext. hal. long.	Sitting	Sitting
	Eversion	Peroneus longus Peroneus brevis	Sitting	Sitting

Table 1.10 Manual Muscle Testing—Shoulder

Joint	Motion	Muscle(s)	Gravity+ Fair	Gravity− Poor
Shoulder	Abduction	Deltoid Supraspinatus	Sitting	Supine
	Extension	Deltoid Latissimus dorsi Teres major	Prone	Side lying
	Flexion	Deltoid Coracobrachialis Pectoralis major	Sitting	Side lying
	Horizon. abd.	Deltoid Teres minor Infraspinatus	Prone	Sitting
	Horizon. add.	Deltoid Pectoralis major	Supine	Sitting
	Lateral rot.	Teres minor Infraspinatus Deltoid	Prone	Prone (with elbow ext.)
	Medial rot.	Deltoid Latissimus dorsi Teres major Pectoralis major Subscapularis	Prone	Prone (with elbow ext.)

Table 1.11 Manual Muscle Testing—Elbow and Wrist

Joint	Motion	Muscle(s)	Gravity+ Fair	Gravity– Poor
Elbow Complex	Flexion	Biceps Brachialis Brachioradialis	Sitting	Sitting (with 90° of shoulder abd.)
	Extension	Triceps Anconeus	Prone (with 90° of shoulder abd.)	Sitting (with 90° of shoulder abd.)
	Supination	Biceps Supinator	Sitting (with 90° of elbow flex.)	Sitting (with 45°–90° of shoulder flex. and 90° of elbow flex.)
	Pronation	Pronator teres Pronator quad.	Sitting (with 90° of elbow flex.)	Sitting (with 45°–90° of shoulder flex. and 90° of elbow flex.)
Wrist	Extension	Ext. c. rad. long. Ext. c. rad. brev. Ext. c. ulnaris	Sitting (with forearm pronation and elbow flex.)	Sitting (with neutral forearm and elbow flex.)
	Flexion	Flex. carpi uln. Flex. carpi rad. Palmaris longus	Sitting (with forearm supination and elbow flex.)	Sitting (with neutral forearm and elbow flex.)

Table 1.12 Special Tests Listing

Joint	Test	Assessment
Shoulder	Apprehension Test	Anterior glenohumeral instability
	Clunk Sign	Labral disorder
	Drop Arm Test	Rotator cuff tear
	Hawkins-Kennedy Impingement Test	Supraspinatus tendon impingement
	Impingement Sign	Impingement of the supraspinatus and/or long head of biceps
	Lock Test	Supraspinatus tendon impingement
	Neer Impingement Sign	Subacromial impingement
	O'Brien Test	Superior labral tear
	Speed's Maneuver	Biceps tendon instability or tendonitis
	Yergason's Test	Biceps tendon instability or tendonitis
Elbow	Cozen's Test	Lateral epicondylitis
	Elbow Flexion Test	Cubital tunnel syndrome
	Golfer's Elbow Test	Medial epicondylitis
	Mill's Test	Lateral epicondylitis
	Tinel's Sign at elbow	Ulnar nerve entrapment

Table 1.12 Special Tests Listing

Wrist and Hand	Allen Test	Radial and ulnar artery circulation
	Bunnel-Littler Test	Tightness of intrinsic muscles
	Carpal Shake Test	Intercarpal synovitis
	Finkelstein's Test	Stenosing tenosynovitis of abductor pollicis longus and extensor pollicis brevis
	Froment's Sign	Ulnar nerve entrapment of elbow and wrist
	Murphy's Sign	Lunate dislocation
	Phalen's Test	Carpal tunnel syndrome
	Tinel's Test	Carpal tunnel syndrome

continues

Table 1.12 Special Tests Listing, *continued*

Joint	Test	Assessment
Hip	90–90 Straight Leg Raise	Hamstring tightness
	Craig Test	Assess femoral anteversion or retroversion
	Ely's Test	Flexibility of rectus femoris
	FABER or Patrick's Test	Hip, lumbar, sacroiliac joint dysfunction or iliopsoas spasm
	Fulcrum Test	Stress fracture of the femoral shaft
	Ober Test	Tightness of iliotibial band and tensor fascia lata
	Hip Piriformis Test	Tightness of the piriformis muscle
	Pelvic Drop Test	Unstable hip or weak external rotators
	Quadrant (Scour) Test	Capsular tightness, an adhesion, myofascial restriction or loss of joint congruity
	Thomas Test	Decreased flexibility of rectus femoris or iliopsoas
	Trendelenburg Sign	Weakness of gluteus medius

Knee	Anterior Draw Test	ACL and medial and posteromedial capsuloligamentous instability
	Apley's Test	Lesion of meniscus
	Apley's Distraction Test	Medial or lateral collateral ligament injury
	Gravity (Godfrey) Sign	PCL injury
	Hughston's Posterolateral Drawer Test	Posterolateral instability
	Lachman's Test	ACL injury
	McMurray's Test	Lesion of medial meniscus
	Posterior Draw	PCL injury
Ankle	Buerger's Test	Poor anterior circulation
	Fleiss Line	Height of the medial arch
	Gungor Test	Anterior displacement of the talus
	Homans' Sign	Deep-vein thrombosis
	Kleiger Test	Integrity of medial (deltoid) ligament
	Matles Test	Chronic Achilles tendon rupture
	Morton's Test	Presence of neuroma or a stress fracture
	Thompson Test	Acute Achilles tendon rupture

continues

Table 1.12 Special Tests Listing, *continued*

Joint	Test	Assessment
Craniovertebral	Barré's Test	Vertebral artery insufficiency
	Dix-Hallpike Test	Vestibular impairment—accumulation of utricle debris
	Modified Sharp-Purser Test	Excessive translation of atlas
Cervical Spine	Compression Test	Brachial plexus injury
	Hyperabduction Maneuver (Wright Test)	Thoracic outlet compression
	Spurling's Test	Nerve root irritability
	Stress Test	Brachial plexus injury
Sacroiliac Joint	Gaenslen's Test	Sacroiliac lesion, hip pathology, or L4 nerve root lesion
	Yeoman's Test	Problem at the sacroiliac joint

ACL=anterior cruciate ligament; PCL=posterior cruciate ligament.

Table 1.13 Selected Special Test Descriptions

Name	Assessment	Positive Test
SHOULDER		
Drop Arm Test	Positive test may indicate rotator cuff tear.	Abduct the shoulder against gravity. Instruct patient to slowly lower arm to side. The patient will not be able to lower arm smoothly and slowly; the arm will drop.
Hawkins-Kennedy Test	Positive test may indicate impingement syndrome involving the supraspinatus.	Flex the shoulder and elbow to 90° then internally rotate the shoulder. The patient will complain of pain.
Impingement Sign	Positive test may indicate impingement of the supraspinatus and/or long head of the biceps.	When sitting, passively horizontally adduct the shoulder with arm in 90° of shoulder flexion. Patient will have pain at the end range.
Neer Test	Positive test may indicate shoulder impingement involving the biceps tendon.	Passively and forcibly flex the shoulder. Patient will complain of pain.

continues

Table 1.13 Selected Special Test Descriptions, *continued*

Name	Assessment	Positive Test
Speed's Test	Positive test may indicate bicipital tendonitis.	Flex the shoulder against gravity about 60° with the elbow extended and forearm supinated. Isometrically resist shoulder flexion at the forearm. Patient will complain of pain at the bicipital groove.
Yergason's Test	Positive test may indicate bicipital tendonitis.	Position the shoulder at the side and flex the elbow to 90° and pronate the forearm. Resist supination and external rotation. Patient will complain of pain at the bicipital groove.
ELBOW		
Golfer's Elbow Test	Positive test may indicate medial epicondylitis.	Stabilize the elbow. Supinate the patient's forearm while extending the elbow and wrist. Patient will complain of pain at the medial epicondyle.
Mill's Test	Positive test may indicate lateral epicondylitis.	Stabilize the elbow. Ask the patient to pronate the forearm and extend and radially deviate the wrist against manual resistance. Patient will complain of pain at the lateral epicondyle.

Table 1.13 Selected Special Test Descriptions

Tinel's Test	Positive test may indicate a problem with the ulnar nerve.	Flex the elbow to 90°. Tap over the ulnar nerve. Patient will complain of paresthesias along the ulnar nerve sensory distribution.
WRIST		
Bunnel-Littler Test	Positive test may indicate tightness of the intrinsic muscles of the hand or a capsular problem of the joints.	Hold the MCP in extension and move the PIP into flexion. The PIP will not be able to be flexed.
Phalen's Test	Positive test may indicate carpal tunnel syndrome.	The patient flexes both wrists and presses the dorsal surfaces against each other to maintain flexion for 1 minute. The patient will experience paresthesias along the median nerve sensory distribution.
Tinel's Sign	Positive test may indicate lateral epicondylitis.	Supinate the forearm. Tap over the median nerve. The patient will experience paresthesias along the median nerve sensory distribution.

continues

Table 1.13 Selected Special Test Descriptions, *continued*

Name	Assessment	Positive Test
HIP		
Ober Test	Positive test may indicate tightness of the iliotibial band or tensor fascia latae.	Position the patient in side lying on the uninvolved limb. Abduct and extend the uphill hip, and then release the limb. The limb will not lower to the uninvolved limb.
Piriformis Test	Positive test may indicate tightness of the piriformis muscle.	Position the patient in side lying on the uninvolved limb. Flex the hip to 60°–90° and the knee to 90°. Stabilize the pelvis and adduct the hip to the table. The patient will complain of pain in the buttocks.
Thomas Test	Positive test may indicate hip flexion contracture.	Place patient in supine. Have patient flex both hips and knees to the chest. Instruct patient to extend one limb to the table. The patient will be unable to fully extend the limb.
Trendelenburg Sign	Positive test may indicate weakness of the gluteus medius.	Have patient stand on one leg. The pelvis will drop to the noninvolved side.

KNEE		
90–90 Straight Leg Raise Test	Positive test may indicate tightness of the hamstrings.	In supine, have the patient flex the hip and knee to 90°. Using the patient's or clinician's hands to maintain hip flexion, extend knee as much as possible. Patient is unable to extend knee beyond –20° extension.
Apley's (Compression) Test	Positive test may indicate meniscus damage.	Have the patient assume the prone position and flex the knee to 90°. With the clinician's hands on the plantar surface of the foot, internally and externally rotate the leg while pressing down. Patient will complain of pain at the knee.
Apley's Distraction Test	Positive test may indicate collateral ligament damage.	Have the patient assume the prone position and flex the knee to 90°. Use one hand to grasp the leg just proximal to the malleoli and distract the leg while the other hand stabilizes at the posterior thigh. Patient will complain of pain at the knee.

Table 1.14 Vital Signs

Note: Normal values may vary from one laboratory to another. The values presented in these charts should not be considered absolute.

Vital Sign	Age Group	Normal Range
Heart Rate (Pulse)	Newborns	70–190 beats/min
	1 y	80–160 beats/min
	2–6 y	70–125 beats/min
	8–12 y	70–110 beats/min
	13–16 y	60–100 beats/min
	Adults	55–100 beats/min
Blood Pressure	Birth–1 mo	Systolic: 60–90 mm Hg Diastolic: 30–60 mm Hg
	2–36 mo	Systolic: 75–130 mm Hg Diastolic: 45–90 mm Hg
	36 mo–adult	Systolic: 90–140 mm Hg Diastolic: 50–80 mm Hg

Respiratory Rate	Birth–1 mo	35–55 breaths/min
	3 mo–6 y	20–30 breaths/min
	6–10 y	15–25 breaths/min
	10–16 y	12–30 breaths/min
	Adults	12–20 breaths/min
Oxygen Saturation (as measured with a pulse oximeter)		Normal oxygen saturation at rest or during exercise is 98%. Exercise may be contraindicated in values of ≤90%.

Table 1.14 Vital Signs

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