

# ICD-10-AM/ACHI/ACS Clinical updates

Version 1.0

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## How to use this document

The ICD-10-AM/ACHI/ACS classification system is used for classifying admitted patient care and comprises the following:

- International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM)
- Australian Classification of Health Interventions (ACHI)
- Australian Coding Standards (ACS).

This document contains previously published clinical updates that support clinical classification.

These have been developed for clinical coding education and can be used over multiple editions, where appropriate.

Previously clinical updates were located in the National Coding Advice publication but as they are for education purposes only, and do not contain coding guidelines, they are now provided separately.

**Note**: these clinical updates have not been updated to reflect the current structure of the ICD-10-AM/ACHI/ACS classification system and should be used for **reference purposes only**.

As clinical concepts evolve over time, clinical coders are encouraged to keep abreast of changes in clinical practice with their own research.

## **Continent urinary diversion ([1129])**

Continent urinary diversion procedures are so described because the urine flow can be controlled and a collection device (bag) is not needed. Rather, a continence mechanism is used to control urine flow. There are two types of continence mechanisms:

- Valve a cutaneous abdominal stoma is formed and a continence mechanism (such as a nipple valve, intussusception valve, flap valve or ileocaecal valve) is used to control urine flow. A catheter is inserted intermittently to drain the pouch.
- Neobladder the pouch is attached to the urethra (neobladder) to enable similar function to that of the native bladder and thereby avoid the need for a stoma.

Continent urinary diversion procedures have a bewildering array of names ureterosigmoidostomy, Mainz pouch I and II, Tiflis pouch, Gotsadse pouch, Koch (Kock) pouch, Indiana pouch, ileal T pouch, continent urinary stoma, orthoptic neobladder, neobladder.

**Ureterosigmoidostomy** (ureteroenterostomy) was the first form of continent urinary diversion, but the procedure had high incidences of complications such as recurrent pyelonephritis and loss of renal function and is now rarely performed. The procedure involves anastomosis of the distal end of the ureter(s) to the sigmoid colon or rectum and relies on normal anal continence to keep the urine in the rectum until defaecation.

The **Koch (Kock) pouch and the Indiana pouch** are the two main continent urinary diversion procedures performed today. In the **Koch pouch procedure**, a pouch (reservoir) is created inside the abdomen with a portion of small bowel (the method is similar to that described for ileal/caecal conduits). The difference is that a nipple valve is constructed at the pouch outlet. The nipple valve holds back the flow of urine and a catheter or tube is inserted several times daily to drain urine from the pouch.

For the **Indiana pouch procedure**, the method is similar to the Koch pouch procedure, except for the segment of bowel resected (the terminal ileum and the caecum) and the valve created (an ileocaecal valve). Normally, the ileocaecal valve is found between the ileum and the caecum and it controls the emptying of waste into the large intestine. In this procedure the ileocaecal valve is relocated to the pouch outlet to provide a continence mechanism for the pouch.

For **neobladder procedures**, the neobladder is fashioned by forming a pouch from a segment of intestine. The ureters are anastomosed to the pouch and the end of the pouch is sutured to the internal urethral meatus. The patient is continent because the external urinary sphincter is preserved. Patients either void spontaneously by using the Valsalva manoeuvre or catheterise the pouch intermittently via the urethra.

Note that the term 'neobladder' usually refers to continent urinary diversion procedures that do not have a cutaneous abdominal stoma (patients have a new bladder which functions in a similar manner to their native bladder). However, the term is also being used to mean procedures that *do have* a cutaneous abdominal stoma, and so, *caution is needed when assigning codes for procedures described as 'neobladder'*.

#### Acknowledgements:

This clinical update has been prepared in conjunction with Mr. Douglas Travis, Urologist and member of the Nephrology/Urology Clinical Coding and Classification Group. Our special thanks to Mr Travis for his enthusiastic contributions to and constant support of the work of the National Centre for Classification in Health (NCCH).

## **Cystic fibrosis**

#### Overview

Cystic fibrosis (CF) is a genetic disorder affecting mostly the lungs but also the pancreas, liver, kidneys and intestine. It can also be known as mucoviscidosis ("Cystic fibrosis", 2015) and two thirds of patients are diagnosed by one year of age. CF is a disease with a wide diversity of clinical presentation, severity of symptoms, and rate of disease progression in the organs involved and the clinical manifestations will vary with the patient's age at presentation (Sharma, 2014).

#### Causes

Cystic Fibrosis (CF) is a recessive genetic condition resulting from inheriting two copies of faulty gene from both parents (Cystic Fibrosis Australia, n.d.). The faulty gene is called the cystic fibrosis transmembrane conductance regulatory gene (known as the CFTR gene) and is responsible for creating a protein that moves salt and water out of a cell. If the CFTR gene is defective, this results in a build-up of thick, sticky mucus in the body's tubes and passageways. These blockages damage the lungs, digestive system and other organs, resulting in inflammation (swelling) and repeated infections (NHS Choices, 2014).

In the lungs, the mucus clogs the tiny air passages and traps bacteria, resulting in repeated infections which can cause irreversible lung damage and death. In the pancreas, the thick mucus also stops digestive enzymes from reaching the small intestine, which leads to difficulty with digesting fats and absorbing some nutrients.

This means that people with CF can have problems with nutrition (Better Health Channel 2012).



Figure 1: Cystic fibrosis - difference in the CFTR gene (University of Utah Health Sciences, n.d.)

#### Prevalence

- One in every 2,500 Australian babies, male or female, of Northern European ancestry
- About one in 25 Australians of Northern European ancestry are carriers for the CFTR gene mutation.
- CF is less frequent in Southern European and Middle Eastern populations and is rare or absent in Asian populations (Genetics in Family Medicine, 2007).

#### Complications

CF has a wide variety of complications across multiple body systems.

These are related to the mucus deposits in various organs, leading to infections and difficulty with absorption of nutrients and vitamins.



Figure 2: What are the signs and symptoms of Cystic fibrosis? (National Heart, Lung, and Blood Institute, 2013)

#### Manifestations

The manifestations of CF affect multiple body systems including:

- respiratory
- gastrointestinal
- genitourinary
- endocrine.



Figure 3: Manifestations of cystic fibrosis (Newson, 2012)

The image above identifies the potential manifestations of CF. Additional manifestations which may occur include:

- pulmonary hypertension
- fatty liver
- liver failure
- cholecystitis
- rickets (Sharma, 2014).

#### Management

CF has no cure; however, treatments have greatly improved in recent years. The goals of CF treatment include:

- preventing and controlling lung infections
- · loosening and removing thick, sticky mucus from the lungs
- preventing or treating blockages in the intestines
- providing enough nutrition preventing dehydration (a lack of fluid in the body) (National Heart, Lung, and Blood Institute, 2013).

Treatment options include:

- antibiotics to treat chest and lung infections
- intensive physiotherapy to clear mucus from the lungs
- enzyme replacement capsules with food to aid digestion
- salt & vitamin supplements
- bronchodilators a type of medication that helps expand the airways inside the lungs, making it easier to breathe
- inhaled mucus-clearing treatments such as Pulmozyme, hypertonic saline (a strong salt solution) and mannitol dry powder
- exercise to help clear the airways and build core strength (Cystic Fibrosis Australia, n.d.; NHS Choices, 2014).

In some cases, a lung transplant may eventually be required if the lungs become extensively damaged.

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### **Dental services**

Coding of dental procedures is a very specialised area that requires an understanding of dental terminology and anatomy. In 1998, NCCH published a two-part article entitled "Clinical Coder's Guide to Dental Services". These articles have been updated here to assist coders to understand common procedures and terms used in dental services.

In ACHI, Eighth Edition dental intervention codes are based on The Australian Schedule of Dental Services and Glossary (9th Edition) published by the Australian Dental Association Incorporated.

#### **Tooth Anatomy**

Knowledge of the anatomy of teeth is important in the understanding of both the disease processes and interventions required for the treatment of dental diseases (see Figure 1).



Figure 1 - Tooth anatomy

#### **Definitions**

Enamel	The tough, shiny, white outer surface of the tooth.
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- Dentin The hard but porous tissue located under both the enamel and cementum of the tooth. Dentin is harder than bone.
- Cementum The layer of tough, yellowish, bone-like tissue that covers the root of a tooth. It helps hold the tooth in the socket. The cementum contains the periodontal membrane.

Crown The visible part of a tooth.

Tooth root The portion of the tooth that lies beneath the gum line and is embedded in bone. The tooth root serves as an anchor to hold the tooth in position.

Pulp	The soft inner structure of a tooth consisting of nerve and blood vessels.
Gingiva	The gum.
Deciduous teeth	The primary or baby teeth; the first set of teeth that are later replaced by permanent teeth.
Exfoliation	The process by which the deciduous teeth fall out to make way for the eruption of permanent teeth.
Eruption	The process by which the teeth break through the gums.

#### **Types and Position of Teeth**

Anterior	The teeth in front of the mouth eg centrals, laterals and cuspids.
Posterior	The teeth at the back of the mouth including molars and bicuspids.
Incisors	The four front teeth in the lower and upper jaw are called incisors. The central pair in the lower and upper jaw are called central incisors and the teeth on either side of the central incisors are called lateral incisors. These teeth are broad and flat with a narrow edge that is used for cutting or snipping off pieces of food.
Canines	The four canine teeth are situated next to the lateral incisors on the lower and upper jaw. They are also referred to as eyeteeth or cuspids. Canines are the longest and most stable teeth in the mouth. They are used to rip and tear food and have a single long root.
Premolars	Next to each of the canine teeth are two premolars, also referred to as bicuspids. These teeth are a cross between canines and molars. Like the canine teeth, premolars have sharp points for ripping; however they also have a broad surface, like molars, for chewing and grinding.
Molars	The last three teeth on both sides of the mouth, in the upper and lower jaw. They are numbered first, second or third molar according to their location. The third molars are also referred to as wisdom teeth. Wisdom teeth are the last teeth in the mouth and are the last teeth to erupt. Molars are the largest teeth in the mouth. They have a broad surface that is used for crushing, grinding and chewing food.



Figure 2 - Types of Teeth



Figure 3 - Names of Anterior and Posterior Teeth

#### **Dental Notation (Dental Numbering) Systems**

Tooth notation, or numbering, systems are used by dentists to associate information to a specific tooth. These notation systems are used in medical records and operation reports to help to identify which specific tooth is being treated. Two common tooth numbering systems used in Australia are the Federation Dentaire Internationale (FDI) Two Digit Notation method and the Palmer notation method.

#### **FDI Two Digit Notation Method**

This notation method is a combination of two numbers. The first number indicates the tooth's location (upper left or right, lower left or right) and the second number indicates the specific tooth (see Table 1).

Table 1 - Quadrant Code
-------------------------

Adult Teeth	Deciduous Teeth
1 - upper right	5 - upper right
2 - upper left	6 - upper left
3 - lower left	7 - lower left
4 - lower right	8 - lower right

Each quadrant contains eight teeth. The teeth are assigned a number from 1 to 8 starting at the central incisor (1) and working toward the 3rd molar (8) (see Table 2).

#### Table 2 - Tooth Codes

- 1 central incisor
- 2 lateral incisor
- 3 canines
- 4 1st premolar
- 5 2nd premolar
- 6 1st molar
- 7 2nd molar
- 8 3rd molar

The combination of these two numbers makes up the FDI two digit notation number (see Figure 4).

						Pe	rmane	ent Te	eth						
Upper Right Upper Left															
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
					L	ower	Right	Low	er Lef	ft					

				Primar	y teel	ih			
Upper Right Upper Left									
55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75
			Lowe	er Right	Low	er Left			

Figure 4 - FDI Tooth Notation Method for Permanent and Deciduous Teeth

#### **Palmer Notation Method**

#### **Permanent Teeth**

In this method the teeth are also divided into quadrants and are numbered from 1 to 8 in the same manner as the FDI notation method. However, the method of identifying the specific quadrant is different. Each quadrant is identified by an <sup>L</sup> shaped symbol. The number of the tooth then sits inside the <sup>L</sup> shaped symbol, with the upper and lower quadrants identified by whether the shape is right side up or upside down as follows (see Figure 5 and Example 1):

J - upper right quadrant	<sup>L</sup> - upper left quadrant
- lower right quadrant	Г - lower left quadrant

Upper right 8_ 7_ 6_	5	4_	3_	2	1]	Lı	L2	Lз	L4	Ŀ	upper left Lő L7 L8
Lower right											lower left
8]7]6]	57	4٦	37	2٦	١٦	Г	$\Gamma^2$	ß	Γ4	F۶	F6 F7 F8

Figure 5 - Palmer Notation Method for Permanent Teeth

#### Example 1

4 Using the Palmer notation, this symbol identifies an upper-right first premolar tooth.

#### **Deciduous Teeth**

The Palmer notation method has a different method for numbering deciduous teeth. The teeth are identified by the letters A to E. The teeth are assigned a letter starting at the central incisor (A) and working toward the 3rd molar (E). The system for the identification of the tooth's position is exactly the same as for permanent teeth (see Figure 6 and Example 2).

Upper right EL DL CL BL AL	upper left La Le Lc Lo Le
Lower right	lower left
Е] D] C] B] A]	ГА ГВ ГС ГО ГВ

Figure 6 - Palmer Notation Method for Deciduous Teeth

#### Example 2

AI

Using the Palmer notation method, this symbol identifies a deciduous lower-right central incisor tooth.

#### **Tooth Surfaces**

There are five possible tooth surfaces that can be restored: buccal, distal, lingual, mesial, and occlusal/incisal (see Figure 7).

	Posterior				Anterior	_
	Distal		_		Distal	
Buccal	Occlusal	Lingual		Buccal	Incisal	Lingual
	Mesial				Mesial	

Figure 7 - Tooth Surfaces for Anterior and Posterior Teeth

Buccal The surface of the tooth that faces toward the cheek.

Distal The proximal surface that is orientated away from the midline of the dental arch. It is the opposite of mesial.

Lingual The tooth surface next to the tongue.

Mesial The proximal surface that is closest to the midline of the dental arch.

Occlusal The surface of the tooth that has contact with the opposing tooth.

Incisal The surface of the tooth that has contact with the opposing anterior teeth. It refers to the cutting edge of an incisor or canine tooth. Dental arch The curved structure that is formed by the teeth in their normal position.

#### **Dental Restorations**

Dental restorations or fillings are used to restore function and integrity to the structure of teeth. The most common causes for the loss of tooth structure are dental caries or tooth trauma.

Dental restorations are classified into two types, direct and indirect (see Table 3).

Direct restorations are performed by placing the restorative material directly onto the tooth. These types of restorations are usually performed in one visit and examples include dental amalgam, glass ionomers, resin ionomers and resin composite fillings.

Indirect restorations involve materials that have been fabricated outside the mouth. Examples include inlays, onlays, veneers, crowns and bridges.

Table 3 - Restorative Material

	Direct	Indirect
Adhesive or tooth-coloured	Compomer	
	composite resin (eg CR, Z100, AECR)	
	glass ionomer (Ketac, Photac, GIC, Dyract)	
	polymer glass	
	porcelain/ceramic	
	acrylic	
Metallic	Amalgam (mercury based alloy)	chrome cobalt
	Galloy (gallium based alloy)	gold
	gold foil	non precious metal

#### **Removal of Teeth**

#### Non-surgical extraction

Also referred to as simple extraction is generally performed under local anaesthetic and is performed on teeth that can be seen in the mouth. The tooth is held with forceps which are then moved back and forth to loosen the tooth until it is removed. Sometimes a luxator is used to help loosen the tooth before it is extracted.

#### **Surgical extraction**

An incision is made into the mucosa and a mucoperiostial flap is raised in order to extract the tooth. In some cases, the tooth will need to be broken into sections to be removed. Surgical extractions may involve teeth that are not visible in the mouth either because the tooth has broken off or has not yet erupted through the gum. Surgical extractions are also performed if a tooth is impacted.

#### **Tooth impaction**

Occurs when a tooth fails to erupt through the gum (or only partially erupts) at the expected time. Wisdom teeth, the last teeth to erupt, are the most common teeth to become impacted.

There are four types of tooth impaction - erupted (already in the mouth), full bony impaction (see Figure 8), partial-bony (see Figure 9) and soft tissue impaction (see Figure 10). An impacted tooth may be painless, however, pain and swelling occurs when the tooth tries to erupt through the overlying gum. Pain may be felt in nearby teeth or the ear on that side. A partially erupted tooth may collect food and debris leading to gum swelling and pericoronitis.



Figure 8 - Full Bony Impaction



Figure 9 - Partial Bony Impaction



Figure 10 - Soft Tissue Impaction

#### Removal of impacted teeth

The procedure for the removal of wisdom teeth varies according to the type of impaction. Wisdom teeth may grow in different directions due to lack of space in the jaw. As a result, the complexity of the surgery depends on the type of impaction. If the tooth has erupted fully it may be removed by a simple extraction. However, a full bony impaction will require a complex surgical extraction.

Impacted wisdom teeth are generally removed by surgical extraction. An incision is made into the gum and the gum tissue is moved out of the way. This exposes the tooth and the bone overlying it. In order to access the tooth, any bone in the way needs to be carefully removed. Once the tooth is exposed, it may need to be broken into pieces or sectioned in order to be removed. Sectioning the tooth enables the tooth to be removed through the smallest possible incision, with the loss of the least amount of bone. Sectioning the tooth also protects important nerves and blood vessels that surround the tooth. Once the tooth has been removed the gum tissue is replaced and the wound is sutured.

#### Classification

#### **Australian Coding Standards**

Dental procedures should be coded following ACS 0016 *General procedure guidelines*, and ACS 0809 *Intraoral osseointegrated implants*. Dental procedures are excluded from ACS 0020 *Bilateral/multiple procedures*.

#### ACS 0016 General procedure guidelines

This standard instructs that procedures which are individual components of another procedure should not be coded.

Fissure sealing may be performed alone or it may be performed as part of tooth preparation for a restoration procedure. Where a restoration includes a fissure sealant on the same tooth, then only assign a code for the restoration.

#### ACS 0809 Intraoral osseointegrated implants

The intraoral osseointegrated implants procedure is a complicated two stage procedure. This standard provides guidelines to assist with coding in this area.

#### ACS 0020 Bilateral/multiple procedures

Codes in Chapter 6 *Dental Services* do not meet the criteria in ACS 0020 *Bilateral/multiple procedures* for ACHI Eighth Edition. Generally, dental procedures should be coded as many times as they are performed. However the following guidelines should be applied to the coding of dental procedures:

- 1. When a code includes reference to a number of teeth it should only be assigned once. For example 97311-03 **[457]** *Removal of 3 teeth or part(s) thereof* specifies the removal of 3 teeth therefore this procedure code should only be assigned once.
- 2. Dental codes that specify per tooth, per root or per cusp (etc) should be coded as many times as they are performed. For example as 97171-00 **[455]** *Odontoplasty, per tooth* should be coded as many times as it is performed.
- Codes that don't indicate that they classify a specific number of teeth should be coded as many times as performed. For example, if documentation specifies that 97414-00
   [462] *Pulpotomy* was performed on four teeth, it should be assigned four times.

#### ACHI

In ACHI Eighth Edition, there are a range of codes to reflect the number of teeth extracted: 1 tooth, 2 teeth, 4 teeth, 5-9 teeth, 10-14 teeth and  $\geq$  15 teeth. These codes are located in blocks **[457]** *Nonsurgical removal of tooth* and **[458]** *Surgical removal of tooth* to simplify the code selection when the mucosa has been incised and the mucoperiosteal flap raised. *Surgical extraction versus nonsurgical extraction:* The distinction between surgical extraction of teeth and nonsurgical extraction of teeth is not always clear. Documentation of "incision of mucosa" is an indication of a surgical tooth extraction. Therefore the following inclusion terms aid code selection:

- "Incision of mucosa and raising of mucoperiosteal flap to remove tooth, followed by suturing of the wound" in block **[458]** *Surgical removal of tooth*.
- "Extraction of tooth without incision of mucosa" in block **[457]** Nonsurgical removal of tooth.

*Full Dental Clearance* is the process whereby all remaining teeth in the mouth are removed. A definition has been added to 97322-01 **[458]** *Full dental clearance* to clarify the meaning of the term. Codes also exist for a "full upper clearance" and a "full lower clearance". A "full upper clearance" is when there are no teeth remaining in the upper jaw after the procedure and a "full lower clearance" is when there are no teeth left in the lower jaw after the procedure.

#### **ACHI Dental Procedures and Definitions**

The following tables list the types of dental interventions that may be performed.

#### **Preventative Dental Services**

Blocks [453] to [455]

Procedure/Terms	Definition
Removal of plaque or stain	Removal of dental plaque and/or stains from the surfaces of all teeth.
Fissure sealing and/or tooth surface sealing	Sealing of non-carious pits, fissures or cracks in a tooth with an adhesive material to prevent development of dental caries at the site.
Odontoplasty	Modification of the contour of the crown of a tooth or the anatomy of the fissure of a tooth.

#### **Periodontic Interventions**

Block [456]

Procedure/Terms	Definition
Root planing with subgingival curettage	The surface of the tooth root is planed to remove rough or contaminated cementum, dentine or deposits of calculus with curettage of the soft tissues of the periodontal pocket and removal of granulation tissue.
Gingivectomy	A surgical procedure to remove the soft tissue wall of the periodontal pocket or swollen gum tissue.
Periodontal flap surgery	Incision and raising of a flap of gingival tissue to enable removal of inflammatory or granulation tissue.

Crown lengthening	A flap procedure to establish an apical gingival margin for greater exposure of the tooth structure.
Osseous graft	A surgical procedure in which a piece of bone or a synthetic substitute is used to replace or repair alveolar bone.
Osseous surgery	Re-shaping and modifying defects and deformities in the bone supporting and surrounding teeth.
Gingival graft	Transference or transplanting gingival or other soft tissue from a donor area in the patient's mouth to an area around a tooth or implant to remedy a gingival deficiency.

#### Oral Surgery

Blocks [457] to [458]

Procedure/Terms	Definition
Nonsurgical removal of teeth	Removal of teeth not requiring a surgical incision (ie without incision of mucosa). See block <b>[457]</b> .
Sectional removal of teeth	Removal of teeth in sections. Bone removal may be necessary however a surgical incision is not required. See block <b>[457]</b> .
Surgical removal of teeth	Removal of teeth where a surgical incision is required. See block <b>[458]</b> .
Full upper dental clearance	Removal of all remaining teeth in the upper jaw.
Full lower dental clearance	Removal of all remaining teeth in the lower jaw.
Full dental clearance	Removal of all remaining teeth in the jaw.
Surgical removal of teeth requiring bone removal and tooth division	Removal of teeth where both removal of bone and sectioning of the tooth is required following a surgical incision. See block <b>[458].</b>

#### Endodontics

Blocks [462] to [464]	
Procedure/Terms	Definition
Pulpotomy	Removal of part of the vital tooth pulp from the pulp chamber. The remaining pulp is then covered with a protective dressing or cement. See block <b>[462]</b> .
Obturation	The phase of a root canal treatment that creates a fluid tight seal along the length of the root canal system.
Extirpation of pulp	Removal of pulp, or necrotic debris of pulp from a tooth's root canal system.
Restorative Types	
Blocks <b>[465]</b> to <b>[469]</b>	
Procedure/Terms	Definition
Restoration	Construction and insertion into a tooth of a restoration which may be metallic, resin-based or porcelain.
Pin retention	Small pins are inserted into the tooth to provide extra support for the restoration material.
Stainless steel crown	A preformed crown is trimmed, contoured and used as coronal tooth restoration.
Post	Insertion of a post into a prepared root canal to provide an anchor for an artificial crown or other restoration.
Prosthodontics	
Blocks <b>[470]</b> to <b>[477]</b>	
Procedure/Terms	Definition
Cast for crown	A post and core fabricated accurately to the dimension of a prepared root canal to provide a foundation for an artificial crown.
Temporary Crown	Construction of a temporary restoration usually made from a resin, to protect the underlying tooth prior to construction of permanent crown.
Full Crown	An artificial crown or full veneer is used to restore a tooth's size, shape and strength.
Pontic Bridge	That part of a bridge which replaces clinical crowns of missing teeth.

Complete denture	A removable dental prosthesis constructed to replace all missing teeth and tissues.
Partial denture	A denture provided for a dental arch in which one or more natural teeth remain.
Partial denture components - Retainer	Metal clasp carefully designed to fit round a tooth. Its main purpose is to hold the denture in place.
Partial denture components - Occlusal rest	A unit of a partial denture that rests upon a tooth surface to provide support for the denture.
Partial denture components - Connecting bar	A bar that joins sections of a partial denture.
Overlay	An extension of a denture covering the occlusal surface of remaining teeth.
Immediate replacement of tooth	This procedure involves the addition of one or more teeth to a denture.
Resilient lining	A resilient tissue bearing surface is added to a denture
Denture maintenance - Relining	Replacement of the tissue fitting surface of a denture to improve its accuracy and fit.
Denture maintenance - Remodelling	Replacement of the resin base of a denture to improve its accuracy and fit. It is different from rebasing in that it also permits rearrangement of teeth.
Denture maintenance - Rebasing	This involves the removal and replacement of a denture base.
Splints	An appliance constructed from either acrylic resin or metal designed to hold or maintain mobile teeth in their predetermined position.
Obturator	A prosthesis constructed to close a congenital or acquired opening in the palate. Usually attached to a partial or complete denture.
Denture characterisation	This process involves the staining and carving of the outer surfaces of the denture.
Dental impression	A negative imprint from which a reproduction or cast can be made.

#### **Orthodontics**

Blocks [479] to [483]

Procedure/Terms	Definition
Removable orthodontic appliance - Passive removable appliance	An appliance designed to maintain the position of the teeth.
Removable orthodontic appliance - Active removable appliance	As opposed to the passive appliance, an active appliance exerts force on teeth or arches to achieve tooth or dental arch movement.
Fixed orthodontic appliance - banding	The application of bands and/or brackets to correct tooth position or arch form.
Extraoral appliance	Extraoral head gear connected to an intra-oral appliance which makes use of the support of the back of the head and neck to transmit extraoral force which is then distributed to the teeth.

#### **General Dental Services**

Blocks [484] to [489]		
Procedure/Terms	Definition	
Occlusal splint	An appliance made of acrylic resin which is designed to relieve abnormal pressures exerted on the temporomandibular joint (TMJ) and other supporting structures.	

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## **Incontinent urinary diversion ([1129])**

Incontinent urinary diversion procedures are so described because the urine flows continuously and a collection device (bag) is needed.

**Ileal or colon/caecal conduits** are the most common types of incontinent urinary diversion procedures. They are so named because an isolated segment of bowel is removed, refashioned into a pouch (reservoir) and relocated to act as a passageway (conduit) for urine to pass from the kidneys to the outside of the body. These procedures may also be described as Bricker's loop, Wallace anastomosis or loop conduit.

A segment of small or large bowel is isolated and resected, with its mesentery (blood supply) and nerves intact. The remaining bowel is anastomosed to restore bowel continuity. The ureters may then be attached to the isolated loop of bowel at the proximal end, hence closing the proximal end of the ureters (Wallace anastomosis). Alternatively, the ureters may be attached to the anti-mesenteric border near the proximal end of the isolated loop of bowel and the open end of the bowel is closed (Bricker's loop). The distal end of the isolated bowel segment is brought out through the abdominal wall as a cutaneous abdominal stoma. Urine drains continuously and collects in a bag attached to the skin around the stoma.

A **cutaneous ureterostomy** is another type of incontinent urinary diversion procedure. One or both ureters are divided and brought through the abdominal wall in an end or loop cutaneous ureterostomy. The loop cutaneous ureterostomy is similar in concept to a loop enterostomy; there are two openings - one a functional stoma, the other a non-functional stoma. This procedure is now rarely performed and may only be performed in children as a temporary measure; the hope is that the ureters can be reconnected later.

#### Acknowledgements:

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### Skin

The NCCH previously published an article titled "How it works - SKIN" in 2003. This article has been updated here to assist clinical coders to understand how skin works. The skin is a functional system of tissues and cells that provides protection from the external environment. The skin is comprised of two main layers - the epidermis and dermis - with subcutaneous tissue beneath.



Figure 1 - Structure of the skin

#### Epidermis

The epidermis is the thin outer layer that is composed of stratified squamous epithelium. There are four different types of cells found in the epidermis:

- keratinocytes
- melanocytes
- Langerhans cells
- Merkel cells

The epidermis is organised into four sublayers or strata:

- stratum basale (basal layer)
- stratum spinosum (spinous layer)
- stratum granulosum (granular layer)
- stratum corneum (keratinised or horny layer)

Newly formed cells in the stratum basale move up towards the surface of the skin pushing old cells upwards. The old cells rise to the surface accumulating keratin as they move. The old cells die, flatten out and overlap to form a tough membrane on the outer surface of the epidermis. Eventually these cells are shed off as calluses or collections of dead skin and are replaced by underlying cells that also become filled with keratin. This process is known as keratinisation and takes between two and four weeks to complete.

#### Dermis

The dermis, located beneath the epidermis, is considerably thicker because it is composed of connective tissue containing elastic fibres (elastin) and protein fibres (collagen). The elastin and collagen fibres give the skin pliability but are resistant to stretching. The dermis contains hair follicles, nails, sweat glands, sebaceous glands, blood vessels and nerves.

The two sublayers of the dermis are:

- Papillary layer a thin layer of loose connective tissue that lies beneath the epidermis. It contains capillaries that nourish the epidermis.
- Reticular layer a dense layer of connective tissue that consists of elastin and collagen fibres.

Elastin and collagen fibres give the skin pliability. Ageing, hormones and ultraviolet rays cause degeneration of elastin and collagen fibres, resulting in wrinkles and sagging of the skin.

#### Subcutaneous tissue

The subcutaneous tissue, also called the superficial fascia or hypodermis, is found beneath the dermis. Subcutaneous tissue consists of adipose (fat) and connective tissue and accommodates large blood vessels and nerves. Fibres in the dermis extend downwards into the subcutaneous tissue connecting the skin to it. In turn, the subcutaneous tissue connects to underlying muscles, bones and tissue.

#### Skin functions

The primary functions of the skin are:

- protection
- regulation of body temperature
- excretion
- detection of stimuli
- synthesis of vitamin D
- blood reservoir

#### Protection

The skin, as a physical barrier to the external environment, protects the body from injury, infection, loss or gain of bodily moisture and UV radiation. The skin's layers of cells provide a protective barrier to underlying body tissues and organs against abrasion and other injuries. Lipid secretions produced by the sebaceous glands assists in preventing loss and gain of bodily moisture. Sebaceous glands in the dermis secrete sebum to lubricate the hair and repel water from the skin. Protection against UV radiation is provided by melanocytes. These pigment-forming cells located at the base of the epidermis produce melanin. Melanin absorbs UV light to protect the epidermis and dermis from the harmful effects of UV light. Exposure to ultraviolet rays stimulates the melanocytes to produce extra melanin resulting in tanned skin.

#### **Regulation of body temperature**

The skin plays a significant role in maintaining body temperature. Sweat glands and blood vessels act as temperature regulators of the skin. Changes in body temperature are detected by receptors in the skin that send nerve impulses to the brain, which respond by sending output nerve impulses back to the sweat glands and the blood vessels. Perspiration is constantly produced by sweat glands. The amount of perspiration sweat glands release is determined by changes in body temperature. An increase in body temperature causes sweat glands to produce perspiration more rapidly. A decrease in body temperature causes sweat glands to produce perspiration less rapidly. Blood vessels in the skin dilate or constrict to assist in maintaining body temperature. When body temperature rises, blood vessels dilate increasing blood flow through the skin, allowing heat to radiate into the external environment. A lowered body temperature causes blood vessels to constrict decreasing blood flow through the skin, allowing heat into the external environment.

#### Excretion

Sweat glands play a small part in the removal of wastes, such as nitrogen, sodium and salt, from the bloodstream. These wastes are present in perspiration secreted by the sweat glands.

#### **Detection of stimuli**

Nerve endings in the epidermis and dermis are called receptors. Receptors perform an important sensory function as they detect stimuli in the external environment. They are specifically designed to respond to temperature, pressure, pain or touch. Some areas of the body have more receptors than others, for example, the fingertips have a vast number of touch receptors, which makes them extra sensitive. Pain receptors are evenly distributed all over the skin and are crucial in preventing injury. The detection of other sensations such as wetness, softness and sharpness is caused by stimulation of different types of receptors at the same time.

#### Synthesis of vitamin D

Vitamin D is an essential precursor to calcitriol, a hormone required for calcium absorption and bone development. While vitamin D may be obtained through diet, ninety percent of vitamin D is produced in the skin. Only a small amount of UV exposure is required for vitamin D production.

#### **Blood reservoir**

Skin serves as a blood reservoir as it contains many blood vessels. The blood vessels supply nutrients to the cells in the basal layer and also remove waste products.

#### Skin facts

- The skin of an average adult weighs about 4 kilograms
- Adult skin surface area is approximately 2 square metres
- Skin cells replace themselves every 28 days
- Old skin cells make up the majority of household dust
- About 70% of skin is water

#### Accessory structures

Accessory structures of the skin include:

- hair
- sebaceous glands
- exocrine glands
- sweat glands
- nails

#### **Healing properties**

Skin has exceptional self-healing properties, especially when only the epidermis is damaged. When injury damages the dermis healing can be achieved if the injured area is in a region of the body with a rich blood supply. Deeper wounds that penetrate to underlying tissue heal by scar formation. Scar tissue is deficient in infection resisting and metabolic functions of healthy skin.

Granulation tissue - newly growing capillaries and connective tissue form granular projections on the surface of ulcers or healing wounds.

Scar tissue - dense fibrous contracted connective tissue that has formed over a healed wound. Scar tissue is also referred to as cicatricial tissue.

Keloid scar - raised red or pink fibrous scar tissue that is the result of excessive tissue repair at the edges of a wound or incision. Keloid scars are more common in people with dark pigmented skin compared to fair skin.

#### SunSmart UV Alert

The SunSmart UV Alert is a tool you can use to protect yourself from ultraviolet (UV) radiation. It lets you know the time during that day you need to be SunSmart. The Alert is issued by the Bureau of Meteorology when the UV index is forecast to reach 3 or above. At that level, it can result in damage to your skin and lead to skin cancer.



Figure 2 - How to read the alert

#### Classification

The codes for skin conditions and procedures are primarily located in ICD-10-AM Chapter 12 *Diseases of the skin and subcutaneous tissue* (L00-L99) and ACHI Chapter 16 *Dermatological and plastic procedures* (blocks 1600-1718).

Helpful hints within the classification

Just a reminder of the following hints and tips which are located in the tabular:

L00–L08: Infections of the skin and subcutaneous tissue

Use additional code (B95-B97) to identify infectious agent.

L20–L30: Dermatitis and eczema

Note: In this block the terms dermatitis and eczema are used synonymously and interchangeably.

L55: Sunburn

**∇** 1911

Includes:

• burns from exposure to man-made ultraviolet radiation

Use additional code (T20-T25, T29-T30) to identify site of sunburn.

Use additional code (T31) to identify the percentage of body surface area.

Use additional external cause code (Chapter 20) to identify cause.

1644: Split skin graft to burn of other sites Split skin autograft to burn of other sites *Includes:* 

- debridement of burn of same site
- dressing of burn of same site
- excision of burn of same site
- excision of skin for graft
- repair of secondary defect by suture

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## The spine – Part A

#### Anatomy

**Spinal (vertebral) column** – The spinal column is formed by the vertebra and is comprised of various levels:

- cervical (7)
- thoracic (12)
- lumbar (5)
- sacral (5)
- coccygeal (4)

The five sacral vertebrae are fused to form the sacrum, and the four coccygeal vertebrae form the coccyx. The spinal column encloses the spinal cord and meninges.

**Spinal canal** – The spinal canal is a narrow, fluid-filled space in the spinal column.

**Spinal cord** – The spinal cord extends from the foramen magnum (within the skull) to the upper part of the lumbar region. There is no spinal cord beyond the first lumbar vertebra.

**Spinal nerve roots** – There are 31 pairs of spinal nerves. They emerge as paired nerve roots from the anterior and posterior spinal cord. Each nerve is then formed by the union of the paired roots.

**Intervertebral discs** – The intervertebral disc is a circular piece of cushioning tissue between each of the vertebrae. Their function is mechanical, allowing movement between the axial and appendicular skeleton and the head. They also assist weight bearing and help protect the spinal cord and nerve roots. Each intervertebral disc is known as a level. There is one disc (level) between two vertebrae.

**Level** – Certain spinal procedures require the specification of the level at which the procedure is being performed. The level of the vertebra is the numbered vertebra, eg L4 is the fourth lumbar vertebra.

The term *level* in relation to spinal surgery refers to the number of levels operated on. Documentation of 'L4/5' means the disc is between L4 and L5 (ie one vertebral interspace or one disc level). For example T1/T2 = one level, T1/T4 = three levels.

**Spinal foramen** – Foramen means opening. Its use in relation to the spine applies to any opening allowing passage of the spinal nerves from the vertebral canal.

**Pedicles** – The pedicle is a stub of bone that connects the lamina to the vertebral body to form the vertebral arch.

**Vertebral lamina** – The vertebral lamina is part of the vertebra at the back portion of the vertebral arch that forms the roof of the canal through which the spinal cord and nerve roots pass.

**Vertebral arch** – The vertebral arch is a circle of bone around the canal through which the spinal cord passes. It is composed of a floor at the back of the vertebra, walls (the pedicles), and a ceiling where two laminae join.

#### **Diseases/conditions of the spine**

**Cord compression** – Compression of the cord occurs where disease or injury creates pressure against the spinal cord. Compression may be caused by different types of lesions that result in segmental sensory, motor, reflex and sphincter deficits. Compression is more commonly caused by lesions outside the spinal cord (extramedullary) than by lesions within it (intramedullary). Lesions that compress the spinal cord may also compress the nerve roots (*see Radiculopathy*).

**Disc herniation** – Disc herniation, or prolapse, occurs when the outer case of the disc splits resulting in the gel inside bulging out of the disc. This bulging may cause pain by pressing on the spinal cord or nerve root.

**Dislocation** – A dislocation of the spine occurs when the vertebrae are misaligned. A **subluxation** is a partial dislocation. Vertebral dislocations are usually due to trauma and typically involve the facets.

**Fracture, compression** – In compression fractures, the vertebrae collapses. Compression fractures can be the result of either pathological processes or trauma.

**Fracture, pathological** – Pathological fractures occur where the bone has been weakened by disease such as with osteoporosis or malignancy. They are common in the thoracic spine (usually below T6) and lumbar spine and may occur with no preceding or only minimal trauma (eg, a minor fall, sudden bending, lifting, coughing).

**Fracture, traumatic** – Traumatic fractures occur as a result of injury and may involve the vertebral body, lamina and pedicles as well as the spinous, articular, and transverse processes.

**Myelopathy** – Diseases or disorders of the spinal cord are referred to as myelopathy. Where this includes disc disorders which impact on the spinal cord, it may result in cord compression.

**Osteoporosis** – Osteoporosis is a progressive metabolic bone disease that decreases bone density, with deterioration of bone structure. Bone weakness leads to fractures with minor or inapparent trauma, particularly in the thoracic and lumbar spine, wrist, and hip.

#### **Complete spinal cord injury**

**Radiculopathy** – Radiculopathy is any disease or disorder impacting on the spinal nerve roots. It is frequently due to compression caused by stenosis or herniation.

**Spinal cord injury** – Injury to the spinal cord occurs when the spinal cord is penetrated or when damage to the vertebrae, ligaments, or discs of the spinal column results in bruising, crushing or tearing of spinal cord tissue. Frequent causes of damage are trauma (car accident, falls, diving etc) or disease (polio, spina bifida, Friedreich's Ataxia etc).

**Spinal stenosis** – Spinal stenosis is narrowing of the spinal canal and may be congenital or acquired. Stenosis may result in compression of the cord or nerve roots, causing back pain. The most common causes of acquired stenosis are osteoarthritis, degenerative disc disorders, spondylosis, and spondylolisthesis with compression of the cauda equina.

**Spondylosis** – Spondylosis is a descriptive term that refers to degeneration (wear and tear) of the vertebrae. Clinically, spondylosis usually occurs with nerve root compression/radiculopathy (*see Radiculopathy*) or myelopathy (*see Myelopathy*).

**Spondylolisthesis** – Spondylolisthesis is the forward slipping of one vertebra over another. When this occurs, the nerves may become compressed in the canal, causing pain.

#### Effects of spinal cord injury

Nerves run from the spinal column to specific areas of the body. By noting where a person has weakness, paralysis, or other loss of function (and therefore nerve damage), a neurologist can determine where the spinal column is damaged. The Merck Manual details the effects of spinal injury:

Level of Injury	Effect*
Between C2 and C5	Paralysis of some or all muscles used for breathing and all arm and leg muscles. Typically, fatal unless a ventilator is used.
Between C5 to C6	Paralysis of legs, trunk, hand and wrist. Weakness of the muscles that move the shoulder and elbow.
Between C6 to C7	Paralysis of legs, trunk and part of the wrists and hands. Normal movement of the shoulders and elbows.
Between C7 and C8	Paralysis of legs, trunk and hands.
C8 to T1	Paralysis of the legs and trunk. Weakness of the muscles that move fingers and hands. Horner syndrome (with a drooping eyelid, a constricted pupil, and reduced sweating on one side of the face). Possibly normal movement of the shoulders and elbows.
T2 to T4	Paralysis of the legs and trunk. Loss of sensation below the nipples. Normal movement of the shoulders and elbows.
T5 to T8	Paralysis of the legs and lower trunk. Loss of sensation below the rib cage.
T9 to T11	Paralysis of the legs. Loss of sensation below the navel.
T11 to L1	Paralysis of and loss of sensation in the hips and legs.
L2 to S2	Various patterns of leg weakness and numbness, depending on the precise level of injury.
S3 to S5	Numbness in the perineum.

\* Loss of bladder and bowel control can occur with severe injury anywhere along the spinal column.

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## The spine – Part B

See The spine – Part A for information on the anatomy, diseases and conditions of the spine

#### Spinal fusion and internal fixation

The spinal fusion surgical procedure is designed to abolish motion between the vertebrae. It is believed that elimination of motion will relieve pain caused by conditions such as degenerative disc disease, prolapsed intervertebral disc, spondylolisthesis, spinal stenosis and a weak or unstable spine from fractures or tumours. Spinal fusion is also performed to correct scoliosis, to prevent the progression of scoliosis and to stabilise the spine particularly in neuromuscular disorders.

Spinal fusion involves joining or fusing two or more vertebra together in order to stabilise the spine. **Bone graft** is packed between the vertebrae to promote growth of new bone and over time fuses bone together.

Bone graft type	Source	
Autograft	Bone from patient's body, eg harvested from iliac crest, spine or ribs during fusion surgery	
Allograft	Donor bone, eg from bone bank	
Bone graft substitutes/stimulators	<ul> <li>Man-made or manipulated natural bone, eg</li> <li>Bone morphogenetic protein (BMP), eg 'Infuse'</li> <li>Ceramic-based Bone Graft Extenders</li> <li>Demineralized Bone Matrix (DBM)</li> <li>Autologous growth factor (AGF)</li> </ul>	

A combination of bone graft types may be used in the one procedure, eg iliac crest bone (autograft), allograft and Infuse (bone graft substitute).

#### Common spinal fusion procedures are:

- Anterior cervical discectomy and fusion (ACDF)
- Anterior lumbar interbody fusion (ALIF)
- Posterior lumbar interbody fusion (PLIF)
- Transforaminal lumbar interbody fusion (TLIF)
- Direct lateral interbody fusion (DLIF)
- Extreme lateral interbody fusion (ELIF or XLIF)
- Posterolateral fusion (PLF)

Access is anterior (front of body), posterior or posterolateral (rear of body, requiring a laminectomy or foramenotomy to access the interbody space), transforaminal (posterior access but through the side of the foramen) or lateral/extreme lateral (side of body).

Fusion may be performed on the cervical, thoracic, lumbar (most common) or lumbosacral spine.

In an interbody fusion, bone graft is placed between the vertebrae where the intervertebral disc would normally be. Bone graft may be placed in an interbody cage, which is a porous cylinder that allows bone to grow through and into the next vertebral body; interbody cages are made of titanium alloy, carbon fibre, PEEK (polyetheretherketone) polymer or allograft bone.

In a posterolateral fusion, the bone graft is placed between the transverse processes of the vertebrae.

Advances in surgical techniques, instruments and monitoring mean that many spinal fusion procedures are able to be performed using minimally invasive techniques.

Spinal fusion may be performed with or without internal fixation/instrumentation but most procedures involve instrumentation to provide immediate stabilisation and maintain alignment of the spine whilst the bone graft fuses.

#### **Spinal fusion codes**

The spinal fusion codes are in block **[1389]** *Spinal fusion* and **[46]** *Decompression of cervical spinal cord.* The codes are based on approach, whether a laminectomy was performed, and the number of intervertebral spaces operated on.

For cervical spinal fusion, different codes are assigned depending on whether or not a decompression of the cervical spinal <u>cord</u> is also performed.

The fusion codes include bone graft, fat graft and procurement of graft material (eg bone or fat) through the same (operative) incision.

Additional codes should be assigned for the following:

- Excision of vertebra
- Internal fixation
- Procurement of bone graft through separate incision, eg from iliac crest
- Procurement of fat for grafting through separate incision
- Rhizolysis (decompression of spinal nerve root).

Spinal internal fixation/instrumentation includes the use of implants such as:

- Screws
  - o Pedicle screws are placed through the pedicle bone and into the vertebral body
  - o Provide anchor points for attachment of rods
- Hooks
  - o Alternative to screws
- Rods
  - o Used to bridge a length of spine
  - o Connect to screws/hooks
  - o Nonsegmental fixation is attached at the top and bottom of the fusion area only

- Harrington rods designed for scoliosis surgery are an example of nonsegmental fixation but are largely superseded now
- o Segmental fixation is attached at multiple levels of the fusion area
  - More common than nonsegmental
  - CD (Cotrel-Dubousset) instrumentation used in scoliosis surgery is an example of segmental fixation
- Plates
  - o May be used instead of rods to connect to screws/hooks
  - o May be used to span short segments of the spine

Spinal internal fixation/instrumentation may be used without spinal fusion, for example, for stabilisation of traumatic or neoplastic (metastatic) bone fractures.

#### Spinal internal fixation/instrumentation codes

The spinal internal fixation/instrumentation codes are in block **[1390]** *Internal fixation of spine.* The codes are based on the type of fixation, and the number of intervertebral spaces operated on for the segmental fixation codes.

#### **Documentation examples**

The examples below demonstrate the type of documentation seen in spinal surgery and are for information only.

#### Example 1:

#### Diagnosis

Right C5 radiculopathy

#### Operation

Procedure

C4/5 ACDF with plate

8mm Synthes cervios cage used with TCP substitute with Vectra plate and 4x16mm selfdrilling screws

#### Operative note

With the patient under GA, lying supine with his neck extended to improve access, the anterior cervical region was prepared with alcoholic iodine. A skin crease right anterior cervical incision was used to gain access to the anterior border of the sternomastoid, then deeper dissection (superior to omohyoid) allowed access to the anterior cervical spine. The image intensifier was used to confirm the C4/C5 level. The anterior 2/3 of the disc space was cleared of soft tissue and degenerate disc material. The anteriorferior edge of the C4 vertebral body was nibbled away and the dense sub-endplate bone was drilled to harvest bone for later use in the interbody cage. The posterior 1/3 of the disc space was then cleared with the high speed drill and punch rongeurs so that the spinal canal and both root canals could be identified and decompressed. Particular attention was paid to decompression of the right C5 root by removal of the posterolateral osteophytes out beyond the pedicle. Haemostasis was assured, then a large 8mm Synthes cage was hammered into the disc space. The wound was then closed in layers. Dressings.

Example 2:			
Diagnosis			
Lumbar spine L4-5-S1 foraminal s	tenosis		
Operation			
Procedure			
Lumbar spine L4-5 posterior fusio	n, L5-S1 PLIF	+ decompres	sion
Operative note			
GA / prone / IV ABx			
Posterior midline incision			
Erector spinae retracted			
Foramin + transverse processes i	dentified		
1 x sacrum screw 7.5 x 35mm		L	R
II level check	L4	6.5x45	6.5x45
5 screws	L5	6.5x45	6.5x45
60mm rods	S1	7.5x35	7.5x35
Distracted, tightened			
L5/S1 disc approached from right			
Discectomy/decortication			
Interbody fusion with graft/cage			
Decompression L4-5-S1			
Posterolateral autologous bone gr	aft		
Vancomycin powder			
II			

1 - V 2 - OV 3 - OM Primipore

#### Example 3:

#### Diagnosis

Pathological # L3 secondary to bone metastases; compression of spinal nerve roots

#### Operation

#### Procedure

Lumbar decompression, rhizolysis, screw and rod fixation

#### Operative procedure

Under fluoroscopic guidance, pedicle screw placements performed at the L2 and L4 levels. At the L2 level, I placed 2 x 4.5 x 45mm pedicle screws. Similar placements were performed at the L4 level. A decompressive laminectomy was performed from L2 to L4 and decompression of the lateral recess. The spinal nerve roots at this level were rhizolysed. Two parallel lordotic rods (8cm) were then secured onto the polyaxial pedicle screw heads and a 50mm cross link attached at the level of L3 vertebral body.

#### **INTERVERTEBRAL DISC PROSTHESIS**

Intervertebral disc prosthesis or artificial disc replacement is an alternative to spinal fusion to treat severe disc degeneration. The procedure is also known as total disc replacement.

The intervertebral disc is surgically removed and the prosthesis inserted in its place. The intervertebral disc prosthesis consists of endplates and a core. The endplates are anchored into the vertebral bodies above and below the disc space and the core sits between the endplates. The core is designed like the original disc, that is, to allow natural motion or movement of the spine and to keep the normal space between vertebrae.

Prosthetic disc nucleus (PDN) replacement or partial disc replacement is an alternative procedure. Only the inner ('jelly') nucleus of the disc is replaced; the annulus (outside of the disc) is retained.

#### HALO

A halo provides immobilisation of the cervical spine, usually after trauma or spinal surgery.

The device consists of a metal ring which is fixed to the skull with metal or titanium pins under local anaesthetic. Adjustable stabilisation bars connect the ring to a vest worn around the patient's chest. The device is able to provide immobilisation of the head and neck as the skull is 'locked down' to the solid thoracic spine, which is a relatively immobile segment of the body.

The halo device is generally required to be worn for three months. Over this time, frequent checks of the correct position and tightness of the device are required.

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## Urinary diversion procedures ([1080] to [1085])

Urinary diversion is a general term applied to procedures where an opening is made into the urinary system to divert urine flow, typically following bladder removal or when bypass of a dysfunctional bladder is required to maintain urinary flow. Urinary diversions can be described as incontinent or continent diversions.

Some urinary diversion procedures are similar in concept to the creation of a gastrointestinal stoma; the flow of urine may be diverted through an opening in the abdominal wall (sometimes called a 'cutaneous abdominal stoma'). In recent years, however, improved techniques have now provided some patients with the choice of avoiding a stoma by having a new bladder created (neobladder) which, with training, can function in a similar manner to a native bladder.

While the terminology associated with these procedures has been clarified, the terms can be used 'loosely'. The following points are simple hints to help distinguish between the various urinary diversion procedures:

- Look for the construction of a valve. If there is no valve constructed (a collection bag is attached to the skin surrounding the stoma), then an incontinent urinary diversion procedure has been performed. If a valve has been constructed (a catheter is used to drain the pouch), then a continent urinary diversion procedure has been performed.
- If a pouch has been formed and there is no mention of a stoma, then a 'neobladder' procedure has been performed.

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## Viral hepatitis

#### Viral hepatitis

Patients with chronic viral hepatitis are often asymptomatic or may have abnormal liver function tests (LFTs). An indication of chronic viral hepatitis is a raised level of alanine transaminase (ALT) and/or aspartate aminotransferase (AST), in the absence of other causes of liver inflammation such as alcohol, non-alcoholic fatty liver disease. Generally, patients with chronic viral hepatitis are followed up 6-12 monthly with blood tests. Six monthly ultrasounds are recommended for surveillance of hepatocellular carcinoma (primary liver cancer) in all patients with cirrhosis, and in some patients with chronic HBV infection in the absence of cirrhosis.

Generally, after recovery from an infection with an organism, a person will develop antibodies to the pathogenic organism. Antibodies to certain infectious diseases can also be produced by vaccination. In these vaccinated people, future blood tests demonstrating the antibodies will indicate past infection or immunisation. Detection of antibodies does not indicate active infection; this is confirmed by detecting the virus in the blood. A person with detectable virus in their blood may or may not manifest symptoms but is potentially infectious and the virus can be transmitted to others.

It is important to understand the distinction between a person who has an active infection (at risk of transmission of infection to others and disease progression) and a person whose antibody results indicate past infection or immunisation to an infectious disease (not an infection risk, and usually not at risk of disease progression). The role of antibody tests in distinguishing between disease status and past infection varies depending on the infection. In some situations, testing for viral nucleic acid (DNA or RNA) is required to determine if actual infection is present.

#### Hepatitis A

Transmission within families is common. In developing countries, the usual source of infection is faecal contamination of drinking water. The hepatitis A virus (HAV) is detected by two antibody tests:

- 1. IgM antibody: positive result indicates recent infection.
- 2. IgG antibody (anti-HA): positive result indicates past infection (previous exposure to HAV) or immunity through vaccination.

#### Hepatitis B

Most people who are infected with HBV as adolescents or adults do not develop symptoms and clear infection spontaneously - they make a full recovery and are left with immunity for life. However, following acute infection, a small minority (approximately 5%) of patients will progress to a chronic infection.

In contrast, most of the global burden of chronic hepatitis B results from mother to infant transmissions or infection in early childhood, in high prevalence countries. Newborn babies of mothers who have hepatitis B (HBsAg positive) are at risk of infection and should receive HBV vaccination and immunoglobulin (within 12 hours of birth and complete a full HBV vaccination schedule). People who are infected with HBV as infants or in early childhood are often asymptomatic, but usually progress to chronic HBV infection.

There are two categories of tests used to diagnose and manage HBV infection:

- 1. serological assays: enzyme immunoassay (EIA) detects specific antibody(ies) to HBV and antigen(s) and includes HBsAg, anti-HBs, HBeAg, anti-HBe, anti-HBcAg.
- 2. molecular assays: detect and/or quantify the amount of viral nucleic acid (HBV DNA [deoxyribonucleic acid]). Tests are divided into two types:
  - qualitative assays: detects presence or absence of HBV DNA
  - quantitative assays: measures the amount of HBV DNA ('viral load') in serum (this is the preferred testing method and includes polymerase chain reaction (PCR) and transcription-mediated amplification (TMA) assays).

Antiviral therapy is used to treat patients with HBV infection, with the current aim of treatments to suppress virus replication and prevent progression of liver disease (EASL 2012). Spontaneous clearance of HBV infection may occur without treatment. This is common in adults following acute infection, but can also occur in people with chronic HBV infection. Resolution of HBV infection is rare with current treatment. Resolved HBV infection is defined as 'previous HBV infection without further virologic, biochemical or histological evidence of active virus or disease' (Lok & McMahon 2009, p. 4).

#### Hepatitis C

The majority of patients (60-70%) with acute HCV infection will progress to a chronic infection. Spontaneous viral clearance after acute HCV infection occurs without treatment in 30-40% of people, usually within the first 6 months after infection.

There are two categories of tests used to diagnose and manage HCV infection:

- 1. serological assays: enzyme immunoassay (EIA) detects specific antibody to HCV (anti-HCV)
- 2. molecular assays: detect and/or quantify the amount of viral nucleic acid (HCV RNA [ribonucleic acid]). Tests are divided into three types:
  - qualitative assays: detects presence or absence of HCV RNA
  - quantitative assays: measures the amount of HCV RNA ('viral load') in serum. This is usually by polymerase chain reaction (PCR).
  - genotype assay: there are 6 main genotypes of HCV. Choice and duration of antiviral treatment, as well as likelihood of response is strongly related to the infecting genotype.

Antiviral therapy is used to treat patients with HCV infection, with the aim of virological cure. Therapy is for a defined time period, usually 24 or 48 weeks. HCV infection is considered to be successfully treated when SVR (sustained virological response) is attained. SVR is defined as the absence of HCV RNA in serum 24 weeks after discontinuing therapy (Ghany et al. 2009, p. 1341).

#### Hepatitis D

Testing for HDV involves serology for hepatitis D antibodies (anti-HDV). However, this does not allow determination of active infection or prior exposure. Hepatitis D virus RNA testing has only limited availability in research settings.

#### Hepatitis E

It is endemic in South-East Asia, countries of the Soviet region, India, mid-east Africa and Central America. Large outbreaks are usually spread by contaminated water. Direct person to person spread can occur but is less common. The normal course of infection is an acute and a relatively benign illness. Whereas, HEV in pregnancy can cause fulminant hepatic failure, particularly in the third trimester, with mortality rates of 15-25%.

It was previously thought that HEV is *never* a chronic infection. However, it has been recently recognised that hepatitis E may result in chronic infection, particularly in immunosuppressed individuals such as organ transplant recipients (Kamar et al. 2012, p. 6).

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