VELO-CARDIO-FACIAL SYNDROME
Defined Specialist Fact Sheet

Velo-cardio-facial syndrome (VCFS) is caused by a deletion of a small segment of the long arm of chromosome 22 known as Deletion 22q11. The following list shows the anomalies that have been found in VCFS. No features are found in 100% of cases, but all occur with sufficient frequency to warrant assessment.

For further information please visit the website of the
VCFS Foundation of NSW
www.vcfsfa.org.au

Craniofacial/Oral Findings

Overt, submucous or occult submucous cleft palate	The condition described as submucous cleft palate is when the palate appears to be structurally intact, but there are bony and/or muscular abnormalities underlying the skin's surface. Sometimes, but not always, it is possible to see the signs associated with submucous cleft palate. These are a bifid uvula (the part of the palate which hangs down at the back is divided), a bony defect in the hard palate (it looks 'dented') and a bluish or white line in the middle of the soft palate.
Retrognathia	Retrusion of the mandible meaning abnormal posterior positioning of the lower jaw relative to the facial skeleton and soft tissues.
Platybasia	An abnormal flattening of the skull base
Asymmetric crying facies in infancy	Asymmetric crying facies is caused by missing or underdevelopment of the depressor anguli oris muscle, one of the muscles that control the movements of the lower lip. The face appears symmetric at rest, but the mouth is pulled downward on one side when the infant is crying
Structurally asymmetric face	One half of the face is shaped differently to the other half of the face.
Functionally asymmetric face	One half of the facial muscles function differently to the other half of the face.
Vertical maxillary excess (long face)	The lower third of the face is out of proportion (too long) in length to the middle and upper thirds.
Straight facial profile	The facial profile has a straight look.
Congenitally missing teeth (one or several)	When one or more teeth fail to develop and therefore do not erupt through the gums
Small teeth	Smaller than expected teeth
Enamel hypoplasia (primary dentition)	Enamel is a protective glass-like outer layer on the visible part of the tooth (crown). Normal tooth enamel is harder than bone. Enamel hypoplasia is seen as smooth-edged surface defects (pits, lines or missing enamel).
Hypotonic, flaccid facies	Weak or slack face
Downturned oral commissures	Downward folds from the corner of the mouth
Cleft lip (uncommon)	A cleft lip is an opening in the upper lip. Normally the lip is formed by the union of two tabs of tissue that grow in from the sides of the face with a central tab that grows down from the tip of the nose. If the union is not complete, the baby is born with a cleft lip.
Microcephaly	Microcephaly is a neurological disorder in which the

	circumference of the head is smaller than average for the age and gender of the person because the brain has not developed properly or has stopped growing.
Small posterior cranial fossa	The cranial fossa is part of the skull that surrounds and protects the brain. The frontal lobe of the brain is situated in the anterior cranial fossa, the temporal lobe in the middle cranial fossa, and the cerebellum in the posterior cranial fossa.

Eye Findings - Eye: The organ of sight. The eye has a number of components. These components include but are not limited to the cornea, iris, pupil, lens, retina, macula, optic nerve, choroid and vitreous.

Tortuous retinal vessels	The vessels which supply and drain the retina are full of twists, turns, or bends.
Suborbital congestion ("allergic shiners")	Darkening of the lower eyelids due to nasal congestion and suborbital edema.
Strabismus also known as cross-eyed, wall-eyes, wandering eyes, deviating eye.	This is a visual disorder when one eye cannot focus with the other, ie one eye tends to cross or turn from what you are looking at.
Narrow palpebral fissures	The opening for the eyes between the eyelids is narrowed.
Posterior embryotoxon	A developmental abnormality marked by a prominent ringlike opacity at the margin of the cornea. The cornea is the transparent structure forming the anterior part of the fibrous tunic of the eye.
Small optic disk	The beginning of the optic nerve in the retina is called the optic nerve head or optic disc.
Prominent corneal nerves	Corneal Nerves are nerves in the eye that are attached to the cornea. They are called prominent when they are visible by examination.
Cataract	A cataract is a clouding of the normally clear lens of the eye. When the amount of light that passes through the lens is reduced and scattered by the cataract, images are not correctly focused on the retina at the back of the eye. The result is that vision becomes poor - it can be compared to looking through a frosted or steamed window.
Iris nodules	Iris nodules can either be busacca or koeppe which are granulomas attached to the iris, or true iris nodules.
Iris coloboma (uncommon)	Coloboma of the iris is visible as a hole, split, or cleft in the iris. Colobomas of the iris may appear as a black, round hole located in or adjacent to the iris (colored portion of the eye). It can appear as a black notch of varying depth at the edge of the pupil, giving the pupil an irregular shape. It can also appear as a split in the iris from the pupil to the edge of the iris.□□A small coloboma, especially if it is not attached to the pupil, may allow a secondary image to focus on the back of the eye, causing a ghost image, blurred vision, or decreased visual acuity.□
Retinal coloboma (uncommon)	Coloboma implies the absence of tissue. A notch or cleft of the retina (part of the retina is missing).
Small eyes	Small eyes come in all shapes, and tend to be smaller in width or length than average eyes, or in comparison to the rest of your features.
Mild orbital hypertelorism	Orbital Hypertelorism is a condition in which the position of the orbits is lateral to the normal position, causing the eyes to be too far apart and grossly deforming the appearance.

Mild vertical orbital dystopia	The term dystopia indicates the mono- and bilateral asymmetry of the orbits.
Puffy upper eyelids	Laxity of the eyelid skin and protrusion of fat around the eyes.

Ear/Hearing Findings - The ear is made up of three different parts: the outer ear (the part you can see); the middle ear (which is separated from the outer ear by the eardrum and contains tiny bones that amplify sound waves); and the inner ear (where sound waves are translated into electrical impulses and sent to the brain).

Overfolded helix	The helix is the curled ridge made of cartilage on the outer edge of the ear.
Attached lobules	Lobules are at the bottom of the outer ear, the soft tissue that hangs down. It is most commonly free hanging.
Protuberant, cup-shaped ears	Protuberant simply means curved outward. The ears are formed into a forward round shape often described as cup shaped.
Small ears	Microtia by definition means small ear or underdevelopment of the outer ear. Microtia is usually broken down into four categories: Grade I – looks like a normal ear but is slightly small with identifiable structures and a small but present external ear canal. Grade II – looks like a curved mass of tissue described as a partial or hemi-ear with a closed off or stenotic (narrow) external ear canal producing a conductive hearing loss. Grade III - is absence of the external ear with a small peanut vestige structure and an absence of the external ear canal and ear drum. Grade IV - is absence of the total ear or anotia. VCFS is usually only associated with Grade 1.
Mildly asymmetric ears	Asymmetric means uneven therefore one ear is lower than the other
Frequent otitis media	Otitis media is an infection or inflammation of the middle ear. (see booklet medical section for more in depth information)
Mild conductive hearing loss	Conductive hearing loss occurs when sound is not conducted efficiently through the outer ear canal to the eardrum and the tiny bones, or ossicles, of the middle ear. Conductive hearing loss usually involves a reduction in sound level, or the ability to hear faint sounds. This type of hearing loss can often be medically or surgically corrected.
Sensori-neural hearing loss (often unilateral)	Sensorineural hearing loss occurs when there is damage to the inner ear (cochlea) or to the nerve pathways from the inner ear (retrocochlear) to the brain. Sensorineural hearing loss cannot be medically or surgically corrected. It is a permanent loss. Sensorineural hearing loss not only involves a reduction in sound level, or ability to hear faint sounds, but also affects speech understanding, or ability to hear clearly. Unilateral means it affects only one ear.
Ear tags or pits (uncommon)	An ear tag is a small skin tag or pit in front of the external ear.
Narrow external ear canals	The external ear canals are the narrow, tubelike passage through which sound enters the ear. Also called external auditory canal. In some VCFS individuals this is narrower than normal leading to ear wax blockages. In most cases, blockage of the ear canal with wax is a harmless event.

Nasal Findings – The nose consists of the dorsum (top of the nose) composed mostly of bone and skin, and the lower part of the nose called the ala, which consists of cartilage and skin. The cartilages themselves are divided into the upper cartilages called the upper lateral cartilages and the lower cartilages called the alar cartilages. The alar cartilages also define the rim of the nostrils.

Prominent nasal bridge	A large top part of the nose
Bulbous nasal tip	Bulbous nasal tip, refers to enlargement or broadening of the tip of the nose. In other words the nose looks to wide. The nasal tip appears squarer whereas the normal nasal tip appears tri-angular.
Mildly separated nasal domes	Nasal tip (end of nose) appears bifid
Pinched alar base, narrow nostrils	The alar base is an integral structure of the base of the nose and plays a significant role in its overall appearance and balance. The rim of the nostrils appear pushed together.
Narrow nasal passages	The passages are smaller than normal.

Cardiac and Thoracic Vascular Findings – The heart consists of 4 chambers. A left and right atria; the receiving chambers and the left and right ventricles the pumping chambers of the heart. The right side receives deoxygenated blood from the body and pumps it to the lungs. The left side receives the oxygenated blood from the lungs and pumps it to the body.

Ventricular septal defect (VSD)	The ventricular septum is the wall that separates the pumping chambers (bottom chambers) of the heart. A hole in this wall is called a VSD. The hole is further defined by its location in the wall.
Atrial septal defect (ASD)	The atrial septum is the wall that separates the receiving chambers (top chambers) of the heart. A hole in this wall is called an ASD. The hole is further defined by its location in the wall.
Pulmonic atresia or stenosis	Atresia means an absence. Stenosis means a narrowing. Pulmonic refers to the valve on the right side of the heart between the right ventricle and the pulmonary artery. This valve can be either absent or narrowed.
Tetralogy of Fallot (TOF)	This is a combination of defects which present together: • Ventricular septal defect - (see defn above) is usually located in the most superior aspect of the septum. • Overriding aorta – the aorta normally exits from the left ventricle. An overriding aorta is where the aorta is positioned directly over a VSD, instead of over the left ventricle. Blood from both the right and left ventricle exit through the aorta in this condition. • Pulmonary stenosis (see defn above) results in right ventricular outflow tract obstruction, The degree of stenosis varies between individuals with TOF and is the primary determinant of symptoms and severity. • Right ventricular hypertrophy: this means the right ventricle is more muscular than normal. This occurs because the right ventricular wall increases in size to deal with the increased obstruction to the right outflow tract (the pulmonary stenosis). This feature is generally agreed to be a secondary anomaly, as the level of hypertrophy generally increases with age. □
Right sided aorta	In right aortic arch the descending thoracic aorta crosses the

(The aorta is the main blood vessel leaving the left side of the heart and distributes blood around the body. It is usually left sided).	right mainstem bronchus. It is often associated with tetralogy of Fallot, pulmonary atresia, truncus arteriosus and other cono-truncal anomalies. A right aortic arch can result aberrant branching of the arch vessels.
Truncus arteriosus	Truncus arteriosus means that one single great vessel (truncus) leads out of the heart, instead of a pulmonary artery and an aorta. There is also a large VSD. As a result of truncus arteriosus, oxygen-rich and oxygen-poor blood mix within the heart via the VSD and are pumped both to the lungs and to the rest of the body.
Patent ductus arteriosus (PDA)	Before birth, the two major arteries—the aorta and the pulmonary artery—are normally connected by a blood vessel called the ductus arteriosus, which is an essential part of the fetal circulation. After birth, the vessel is supposed to close within a few days as part of the normal changes occurring in the baby's circulation. In some babies, however, the ductus arteriosus remains open (patent). This opening allows blood to flow directly from the aorta into the pulmonary artery, which can put a strain on the heart and increase the blood pressure in the lung arteries.
Interrupted aorta, type B	Complete discontinuation between the ascending and descending thoracic aorta. Type A: Interruption distal to the subclavian artery that is ipsilateral to the second carotid artery. Type B: Interruption between second carotid artery and ipsilateral subclavian artery. Interruption between carotid arteries.
Coarctation of the aorta	Coarctation of the aorta is a constriction (narrowing) of a part of the aorta, the main artery carrying blood to the body. This generally occurs close to the region where arteries to the head and neck arise. The constriction obstructs blood flow to the lower parts of the body. It causes blood pressure to increase above the coarctation, resulting in higher blood pressure in the upper part of the body compared with the lower part of the body.
Aortic valve anomalies	The aortic valve connects the left ventricle and the aorta. Normally it is comprised of three cusps (leaflets), the valve's function is to prevent blood flow back into the left ventricle once it has moved into the aorta for peripheral circulation. Congenital anomalies include abnormal cusp number, stenosis, atresia, regurgitation (leaking valve) and prolapse (valve does not close properly).
Aberrant subclavian arteries	The right subclavian artery arises from the aorta distal to the left subclavian artery. Left aortic arch with (retroesophageal) aberrant right subclavian artery is the most common aortic arch anomaly.
Vascular ring	The defining feature of all vascular rings is encirclement of the trachea and esophagus by connected segments of the aortic arch and its branches.
Anomalous origin of carotid artery	An anomalous phenomenon deviates from what is expected. Therefore in this condition the carotid artery comes off the aorta in a different place to normal.
Transposition of the great vessels	In the normal heart the right side of the heart receives blood from the body and sends it to the lungs. The left side of the

	heart receives blood from the lungs and sends it to the body. In transposition of the great arteries, the aorta and pulmonary artery are reversed. Therefore the right side receives blood from the body and send it back to the body. The left side of the heart receives blood from the lungs and sends it back to the lungs. For survival an ASD or VSD (or both) must be present so that the oxygenated and deoxygenated blood can mix. This connection can be made surgically until the infant is stable for corrective surgery.
Tricuspid atresia	Atresia means absent. An absent tricuspid valve means no blood can flow from the right atrium to the right ventricle. As a result, the right ventricle is small and not fully developed. The child's survival depends on there being an ASD and usually a VSD. As a result, the venous blood that returns to the right atrium flows through the ASD and into the left atrium. There it mixes with oxygen-rich blood from the lungs. Most of this poorly oxygenated mixture goes from the left ventricle into the aorta and on to the body. The rest flows through the VSD into the small right ventricle, through the pulmonary artery and back to the lungs. Because of this abnormal circulation, the child looks blue (cyanotic).

Vascular Anomalies

Medially displaced internal carotid arteries	Variations of the course of the internal carotid artery in the parapharyngeal space where the carotids usually placed laterally tend to a more central (medial) position.
Tortuous or kinked internal carotids	Variations of the course of the internal carotid artery in the parapharyngeal space either looping or kinking which can lead to bulging and partially obliterating the piriform sinus.
Jugular vein anomalies	The jugular veins are in the neck and drain blood from the head, brain, face and neck and convey it toward the heart. Any deviation from their normal shape or route is termed an anomaly.
Absence of internal carotid artery (unilateral)	Not having an internal carotid artery present on one side of the neck
Absence of vertebral artery (unilateral)	Not having vertebral artery present on one side of the spine leading to the circle of Willis.
Low bifurcation of common carotid	Where the bifurcation or forking of the common carotid occurs lower than normal sometimes in the thoracic region
Tortuous or kinked vertebral arteries	Looping or kinking of the vertebral arteries that lead to bulging and obstruction.
Reynaud's phenomenon	Reynaud's phenomenon is a circulatory disorder. During an attack, blood vessels narrow. This causes blood flow to the fingers and sometimes ears, nose, and lips to be severely reduced. Cold temperatures or emotional stress, such as excitement or nervousness, are the usual causes of attacks. Although blood vessels naturally become narrower under these circumstances, Raynaud's is an abnormally exaggerated response. An attack of Raynaud's may last a few minutes to a few hours. During an attack, symptoms may include: Skin discoloration – during an attack, skin color may change to white, blue, and red. White occurs when the arteries narrow or collapse. Blue appears when the fingers, toes, or other areas are not

	getting enough oxygen-rich blood. The skin turns red when the attack subsides and blood returns. Throbbing and tingling sensations - may occur at the end of the attack as blood flow increases and returns to the extremities.
Small veins	Smaller than normal veins
Circle of Willis anomalies	The circle of Willis (also called the cerebral arterial circle or arterial circle of Willis) is a circle of arteries that supply blood to the brain. The most common anomaly for the circle of Willis is an absence of one of the posterior communicating arteries. Abnormalities of the circle of Willis result in cerebral collateral circulation problems.

Neurologic, Brain, and MRI Findings

Periventricular cysts (mostly at anterior horns)	The term periventricular refers to an area of the brain that is near or around a ventricle. A cyst is a closed sac having a distinct membrane and develosion on the nearby tissue. They may contain air, fluid, or semi-solid material.
Small cerebellar vermis	The cerebellar vermis is a narrow, worm shaped structure in between both sides of the cerebellum. The cerebellum is an area in the back, bottom part of the brain that plays an important role in movement and coordination. There is a top portion of the vermis and a bottom portion. The top portion is called the superior cerebellar vermis and the bottom portion is called the inferior cerebellar vermis. The bottom portion is sunken between the two sides of the cerebellum. The cerebellar vermis receives information from the spinal cord about the sense of touch and proprioception. Proprioception is the ability to sense or perceive the spatial position and movements of your body. The cerebellar vermis also receives information from the body about hearing, vision, and balance. Therefore a small cerebellar vermis can affect functioning in these areas.
Cerebellar hypoplasia/dysgenesis	The cerebellum is the part of the brain that regulates the control and coordination of movement. In this condition, the cells of the cerebellum do not mature normally before birth, causing clinical signs relating to poor balance and incoordination.
White matter UBOs (unidentified bright objects)	Patchy periventricular white matter lesions.
Generalized hypotonia	Refers to a pathologically decreased postural tone that involves the four extremities, the trunk, and the neck. Facial involvement is not a requisite for the diagnosis of generalized hypotonia.
Cerebellar ataxia	Cerebellar ataxia is a loss of muscle coordination caused by damage and/or degeneration of the cerebellum or connections to it. The cerebellum is an area in the back, bottom part of the brain that plays an important role in movement and coordination. Areas connecting to the cerebellum that can cause cerebellar ataxia are the pons, cerebellar peduncles, red nucleus, and cerebellar peduncles. The pons is a part of the brainstem that is very important for sleep and arousal. The brainstem is an area in the lower part

	of the brain that connects it with the spinal cord. The cerebellar peduncles are bundles of nerve fibers that connect the brainstem with the peduncles. The red nucleus is a large, well-defined, reddish-gray, elongated mass of cells in the midbrain that receive massive amounts of input from the cerebellum. The midbrain is the top part of the brainstem.
Seizures	Seizures are caused by abnormal electrical discharges in the brain. Symptoms may vary depending on the part of the brain that is involved, but seizures often cause unusual sensations, uncontrollable muscle spasms, and loss of consciousness.
Strokes	Stroke is the clinical designation for a rapidly developing loss of brain function due to an interruption in the blood supply to all or part of the brain. This phenomenon can be caused by thrombosis, embolism, or hemorrhage.
Spina bifida/meningomyelocele	Spina bifida is a neural tube defect: incomplete closure of the embryonic neural tube results in an incompletely formed spinal cord. In addition, the bones of the spine (vertebrae) overlying the open portion of the spinal cord do not fully form and remain unfused and open. Meningomyelocele is the most significant form and is that which leads to disability in most affected individuals. Spina bifida can be surgically closed after birth, but this does not restore normal function to the affected part of the spinal cord and an individual with this condition will have dysfunction of the spinal cord and associated nerves from the point of the open defect and below
Mild developmental delay	A child with developmental delay is a child who is not achieving certain skills as quickly as expected. In other words, the child is not reaching developmental landmarks at the usual age.
Enlarged Sylvian fissure	The lateral sulcus (also called Sylvian fissure or lateral fissure) is one of the most prominent structures of the human brain. It divides the frontal lobe and parietal lobe above from the temporal lobe below. It is in both hemispheres of the brain but is longer in the left hemisphere.

Pharyngeal/Laryngeal/Airway Findings

Upper airway obstruction in infancy	An acute upper airway obstruction is a blockage of the upper airway, which can be in the trachea, laryngeal (voice box), or pharyngeal (throat) areas.
Absent or small adenoids	The adenoids are a single clump of tissue in the back of the nose (nasopharynx). They are located on the back wall of the throat (pharynx) about one inch above the uvula (the little teardrop shaped piece of tissue that hangs down in the middle of the soft palate).
Laryngeal web (anterior)	The vocal folds are supposed to separate during development. If this separation does not occur and a web of tissue is left across the laryngeal inlet it is called a laryngeal web or glottic web.
Large pharyngeal airway	The pharyngeal or upper airway is a complex structure responsible for respiration, speech, and swallowing. This vulnerable, non-rigid airway is necessary to accommodate the laryngeal motility necessary for speech.

Laryngomalacia	Laryngomalacia (literally, "soft larynx") is a very common condition of infancy, in which the soft, immature cartilage of the upper larynx collapses inward during inhalation, causing airway obstruction.
Arytenoid hyperplasia	The arytenoid cartilages are a pair of small three-sided pyramids which form part of the larynx, to which the vocal cords are attached. Each is pyramidal in form, and has three surfaces, a base, and an apex. Hyperplasia means an increase in size of these cartilages.
Pharyngeal hypotonia	Low muscle tone of the throat.
Asymmetric pharyngeal movement	One side of the throat muscles do not move properly.
Thin pharyngeal muscle	Thinner than normal throat muscles.
Unilateral vocal cord paresis	One vocal cord does not function.
Reactive airway disease	Reactive airway disease" is a general term and does not indicate a specific diagnosis. It may be used to describe a history of coughing, wheezing or shortness of breath due to undetermined cause. These signs and symptoms may or may not be caused by asthma. Time or further testing will tell. Use of the term "reactive airway disease" in part reflects the difficulty in establishing a diagnosis of asthma in certain situations. This is especially true with very young children. Breathing tests needed to confirm a diagnosis of asthma are not practical in young children because they require cooperation and understanding to get good results. Children usually don't develop these skills until age 4 years — sometimes older.
Asthma	Asthma is a chronic disease of the respiratory system in which the airway occasionally constricts, becomes inflamed, and is lined with excessive amounts of mucus, often in response to one or more triggers. These episodes may be triggered by such things as exposure to an environmental stimulant (or allergen), cold air, exercise or exertion, or emotional stress. In children, the most common triggers are viral illnesses such as those that cause the common cold. This airway narrowing causes symptoms such as wheezing, shortness of breath, chest tightness, and coughing, which respond to bronchodilators.

Abdominal/Kidney/Gut -the kidneys are bean-shaped excretory organs. Part of the urinary system, the kidneys filter wastes (such as urea) from the blood and excrete them, along with water, as urine.

Hypoplastic/aplastic kidney	A hypoplastic kidney is small and underdeveloped. Since such a kidney may contain precancerous cells, its presence is a greater cause for concern
Cystic kidneys	Cystic kidney disease describes several conditions in which fluid-filled cysts form in the kidneys.
Inguinal hernias	Are protrusions of abdominal cavity contents through an area of the abdominal wall commonly referred to as the groin, and known in anatomic language as the inguinal area. They are very common and their repair is one of the most frequently performed surgical operations.
Umbilical Hernias	An umbilical hernia is a protrusion (outward bulging) of the abdominal lining, or a portion of abdominal organ(s), through

	the area around the navel (belly-button)
Malrotation of bowel	Malrotation is an abnormality of the bowel, which happens while the baby is developing in the womb. Early in pregnancy, the bowel is a long straight tube leading from the stomach to the rectum. The bowel then moves into the umbilical cord temporarily while it develops into the large and small bowel. Around the tenth week of pregnancy, the bowel moves back into the abdomen and coils up to fit into the limited space there. If the bowel does not coil up in the correct position, this is called malrotation.
Diastasis recti	Diastasis recti is a separation between the left and right side of the rectus abdominis muscle, which covers the front surface of the belly area.
Diaphragmatic hernia (uncommon)	A diaphragmatic hernia is an abnormal opening in the diaphragm, occurring before birth, that allows part of the abdominal organs to migrate into the chest cavity.
Hirschsprung megacolon (rare)	People with Hirschsprung's disease lack the nerve cells that enable intestinal muscles to move stool through the large intestine (colon). Stool becomes trapped in the colon, filling the colon and causing it to expand to larger than normal. Hirschsprung's disease is also called megacolon.

Limb Findings

Small hands and feet	Smaller than expected hands and feet.
Tapered digits	Tapered means a gradual decrease in thickness or width of an elongated object. Digit refers to fingers. Therefore the fingers get gradually narrower from base to tip.
Short nails	Nails are short
Rough, red, scaly skin on hands and feet	Rough, red, scaly skin on hands and feet
Morphea	Also known as localised scleroderma is a disorder characterized by thickening and induration's of the skin and subcutaneous tissue due to excessive collagen deposition. Morphea subtypes are classified according to their clinical presentation and depth of tissue involvement; they include plaque-type, generalized, linear, and deep varieties.
Contractures	an abnormal condition of a joint caused by a loss of muscle fibers or a loss of the normal flexibility of the skin.
Triphalangeal thumbs	Triphalangeal thumbs are characterized by a long, finger-like thumb with three phalanges (joints) instead of two
Polydactyly, both pre- and postaxial (uncommon)	Polydactyly or polydactylism, also known as hyperdactyly, is the anatomical variant consisting of more than the usual number of digits on the hands and/or feet. When each hand or foot has six digits, it is sometimes called hexadactyly, or hexadactylism.
Soft tissue syndactyly	A congenital anomaly of the hand or foot, marked by the webbing between adjacent fingers or toes. Syndactylies are classified as complete or incomplete by the degree of joining. Syndactylies can also be simple or complex. Simple syndactyly indicates joining of only skin or soft tissue; complex syndactyly marks joining of bony elements.

Problems in Infancy

Feeding difficulty, Failure-to-thrive	The babies with feeding problems typically had a history of gagging, vomiting, or irritability with feeds, and slow or difficult advancement of feeding volume.
Nasal vomiting	Feeding difficulties/reflux (nasal vomiting of milk), this is usually due to a problem with the soft palate and can be treated when the child is older. This is the more prominent feature associated with VCFS.
Gastroesophageal reflux	The backward flow of stomach contents into the oesophagus due to a malfunction in the sphincter at the end of oesophagus. This can cause heartburn and discomfort.
Irritability	Irritability is an excessive response to stimuli. Irritability may manifest in behavioral responses to both physiological as well as behavioral stimuli, including environmental, situational, sociological, and emotional stimuli.
Chronic constipation (not Hirschsprung megacolon)	Chronic constipation (faecal impaction) means having a large mass of dry, hard stool in the rectum. This happens because you are regularly constipated over long periods of time. See booklet for a more in-depth discussion on constipation.

Genitourinary - the genitourinary system is the organ system of all the reproductive organs and the urinary system. These are often considered together due to their common embryological origin.

Hypospadias	A birth defect in which a boy's urethra, through which urine and semen pass, opens on the underside of the penis rather than at the end. Almost always correctable with surgery. See booklet for a more in-depth discussion.
Cryptorchidism	Failure of one or both of the testicles to descend into the scrotum.
Vesico-ureteral reflux	Vesico-ureteral also called vesicoureteric reflux, the passage of urine from the bladder back into a ureter.

Speech/Language - Speech can be described as an act of producing voice through the use of the vocal folds and vocal apparatus to create a linguistic act designed to convey information. Language is a system, used to communicate, comprised of a set of symbols and a set of rules (or grammar) by which the manipulation of these symbols is governed. Human languages use patterns of sound (verbal language) and/or hand gesture for symbols (non verbal language).

Severe hypernasality	Swallowing and speaking are complex motor functions requiring the coordination of a diverse group of muscles in the upper airway. Hypernasality is a speech disorder that occurs when the tissues of the palate and pharynx do not close properly, and air leaks from the nose during speech.
Severe articulation impairment (glottal stops)	An omission, where a sound is Articulated in the larynx (sounding like a grunt) and substituted for a sound normally articulated in the oral cavity. In VCFS Glottal Stops are often substituted for all other consonants except m, n, and ng. Glottal stop substitutions would make the word "puppy" sound like "uh-ee".
Language impairment (usually mild delay)	A language disorder is an impairment in the ability to understand and/or use words in context, both verbally and nonverbally.
Velopharyngeal insufficiency	VPI is the failure for the muscular portion of the soft palate

(usually severe)	(velum) and the throat (pharynx) to close completely during normally non-nasal speech. If air leaks into the nose during speech, this is VPI. However, it is possible to have VPI without resulting hypernasality, but it is not possible to have hypernasality without VPI.
High pitched voice	The voice consists of sound made by a human using the vocal folds for talking, singing, laughing, crying and screaming. The vocal folds, in combination with the lips, the tongue, the lower jaw, and the palate, are capable of producing highly intricate arrays of sound. Voice frequency (VF) is one of the frequencies, within part of the audio range that is used for the transmission of speech. The voiced speech of a typical adult male will have a fundamental frequency of from 85 to 155 Hz, and that of a typical adult female from 165 to 255 Hz. When the voice is above this usual frequency the voice is referred to as high pitched.
Hoarseness	Hoarseness is described as having difficulty producing sound when trying to speak, or a change in the pitch or quality of the voice. The voice may sound weak, excessively breathy, scratchy, or husky.

Cognitive/Learning

Learning disabilities (math concept, reading comprehension)	Learning disabilities are problems that affect the brain's ability to receive, process, analyze, or store information. These problems can make it difficult for a student to learn as quickly as someone who isn't affected by learning disabilities. There are many kinds of learning disabilities. Most students affected by learning disabilities have more than one kind. Certain kinds of learning disabilities can interfere with a person's ability to concentrate or focus and can cause someone's mind to wander too much. Other learning disabilities can make it difficult for a student to read, write, spell, or solve math problems.
Concrete thinking, difficulty with abstraction	Concrete thinking is the inability to abstract. For example, if asked to explain what the saying "people in glass houses shouldn't throw stones"means; they reply, "You might break the glass." That is a CONCRETE answer because it shows that the person does not grasp the abstract meaning of the saying. Those who look beyond the actual words, to the meaning realize that the"people who live in glass houses" proverb is cautioning against 'judging lest ye be judged'.
Drop in IQ scores in school years (test artifact)	Researches have indicated that there is a possibility of IQ scores varying throughout a person's lifetime, in fact as much as 20 points! There are many reasons that can account for a change in an individual's IQ scores, from growth spurts to emotional or personal problems. Especially during infancy and early childhood, there is a possibility of change in IQ scores frequently. However, IQ scores begin to stabilize in middle childhood. Furthermore, by the age of approximately 7 years, childhood IQ scores are found to be rather good predictors of adult IQ.
Borderline normal intellect	Intelligence (intellect) is a property of mind that encompasses many related mental abilities, such as the capacities to reason, plan, solve problems, think abstractly,

	comprehend ideas and language, and learn. Although intelligence is sometimes viewed quite broadly, psychologists typically regard the trait as distinct from creativity, personality, character, knowledge, or wisdom.
Occasional mild mental retardation	Mental retardation is a term for a pattern of persistently slow learning of basic motor and language skills ("milestones") during childhood, and a significantly below-normal global intellectual capacity as an adult. One common criterion for diagnosis of mental retardation is a tested intelligence quotient (IQ) of 70 or below.
Attention deficit hyperactivity disorder	The disorder is characterized by a persistent pattern of inattention and/or hyperactivity-impulsivity. ADHD initially appears in childhood and manifests itself with symptoms such as hyperactivity, forgetfulness, poor impulse control, and distractibility. ADHD is currently considered to be a persistent and chronic syndrome for which no medical cure is available. ADHD is most commonly diagnosed in children and, over the past decade, has been increasingly diagnosed in adults.

Miscellaneous anomalies

Spontaneous oxygen desaturation without apnea	A sudden unexplained drop in the oxygen level In the blood
Thrombocytopenia, Bernard-Soulier disease	Thrombocytopenia is the term for a reduced platelet (thrombocyte) count. It happens when platelets are lost from the circulation faster than they can be replaced from the bone marrow where they are made. Thrombocytopenia can result from either a failure of platelet production or an increased rate of removal from blood. Platelets are tiny cells that circulate in the blood and whose function is to take part in the clotting process.
Juvenile rheumatoid arthritis	Juvenile rheumatoid arthritis is arthritis that causes joint inflammation and stiffness for more than 6 weeks in a child of 16 years of age or less. Inflammation causes redness, swelling, warmth, and soreness in the joints, although many children with JRA do not complain of joint pain. Any joint can be affected and inflammation may limit the mobility of affected joints.
Poor body temperature regulation	Thermoregulation is the ability of an organism to keep its body temperature within certain boundaries, even when temperature surrounding is very different. Poor thermoregulation means individuals over heat very quickly or get cold very easily.

Psychiatric/Psychological

Bipolar affective disorder (also known as manic depression or bipolar depression)	Bipolar Disorder is a mood disorder. The sufferer experiences marked mood swings which are beyond what most people experience. These extremes of mood may include the lows of depression as well as the highs of a very elated mood (known as mania). The number and frequency of these periods of depression and mania vary from person to person. It is important to note that everyone has mood swings from time to time. It is only when these moods become extreme and interfere with personal and professional life that Bipolar

	Disorder may be present and medical assessment may be warranted.
Manic depressive illness and psychosis (also known as Bipolar disorder)	Sometimes, severe episodes of mania or depression include symptoms of psychosis (or psychotic symptoms). Common psychotic symptoms are hallucinations (hearing, seeing, or otherwise sensing the presence of things not actually there) and delusions (false, strongly held beliefs not influenced by logical reasoning or explained by a person's usual cultural concepts). Psychotic symptoms in bipolar disorder tend to reflect the extreme mood state at the time. For example, delusions of grandiosity, such as believing one is the President or has special powers or wealth, may occur during mania; delusions of guilt or worthlessness, such as believing that one is ruined and penniless or has committed some terrible crime, may appear during depression. People with bipolar disorder who have these symptoms are sometimes incorrectly diagnosed as having schizophrenia, another severe mental illness.
Rapid or ultrarapid cycling of mood disorder	The term "rapid cycling" describes many different patterns of cycling. The underlying illness, bipolar disorder, manifests in episodes of mania and depression. But the pattern of cycles, the "course of illness," is not fixed. Rapid cycling is defined as four or more manic, hypomanic, or depressive episodes in any 12-month period.
Mood disorder	Two of the most common mood disorders are depression and bipolar disorder (see appropriate section for definition).
Depression (also called major depressive disorder, or sometimes unipolar when compared with bipolar disorder, which is sometimes called manic depression)	Clinical depression is a state of intense sadness, melancholia or despair that has advanced to the point of being disruptive to an individual's social functioning and/or activities of daily living. Although a low mood or state of dejection that does not affect functioning is often colloquially referred to as depression, clinical depression is a clinical diagnosis and may be different from the everyday meaning of "being depressed." Many people identify the feeling of being depressed as "feeling sad for no reason", or "having no motivation to do anything." One suffering from depression may feel tired, sad, irritable, lazy, unmotivated, and apathetic. Clinical depression is generally acknowledged to be more serious than normal depressed feelings. It often leads to constant negative thinking and sometimes substance abuse.
Hypomania	A condition similar to mania but less severe. The symptoms are similar with elevated mood, increased activity, decreased need for sleep, grandiosity, racing thoughts, and the like. However, hypomanic episodes differ in that they do not cause significant distress or impair one's work, family, or social life in an obvious way while manic episodes do. Hypomanic people tend to be unusually cheerful, have more than ample energy, and need little sleep. Hypomania is a pleasurable state. It may confer a heightened sense of creativity and power. However, hypomania can subtly impair a person's judgment. Too much confidence can conceal the consequences of decisions. Hypomania can be difficult to diagnose because it may masquerade as mere happiness. It is important to diagnose hypomania because, as an expression of bipolar disorder, it can cycle into depression.

Schizoaffective disorder	Schizoaffective disorder is a major psychiatric disorder that is quite similar to schizophrenia. The disorder can affect all aspects of daily living, including work, social relationships, and self-care skills (such as grooming and hygiene). People with schizoaffective disorder can have a wide variety of different symptoms, including problems with their contact with reality (hallucinations and delusions), mood (such as marked depression), low motivation, inability to experience pleasure, and poor attention. The serious nature of the symptoms of schizoaffective disorder sometimes requires patients to be hospitalized at times for treatment. The experience of schizoaffective disorder can be described as similar to "dreaming when you are wide awake"; that is, it can be hard for the person with the disorder to distinguish between reality and fantasy.
Schizophrenia	Schizophrenia (meaning "split mind") is a psychiatric diagnosis that describes a mental disorder characterized by impairments in the perception or expression of reality and by significant social or occupational dysfunction. A person experiencing schizophrenia is typically characterized as demonstrating disorganized thinking, and as experiencing delusions or hallucinations, in particular auditory hallucinations. Although the disorder is primarily thought to affect cognition, it also usually contributes to chronic problems with behavior and emotion.
Impulsiveness	Impulsiveness is the immediate response to thoughts or deeds without any consideration of the appropriateness or consequences.
Flat affect	A severe reduction in emotional expressiveness. People with depression and schizophrenia often show flat affect. A person with schizophrenia may not show the signs of normal emotion, perhaps may speak in a monotonous voice, have diminished facial expressions, and appear extremely apathetic. Also known as blunted affect.
Dysthymia	A disorder with similar, but longer-lasting and milder symptoms than clinical depression. By the standard psychiatric definition, this disorder lasts for at least two years, but is less disabling than major depression; for example, those affected are usually able to go on working and do not need to be hospitalized.
Cyclothymia	Cyclothymia is a chronic, but less extreme, form of bipolar disorder that consists of short periods of mild depression alternating with short periods of hypomania. The onset of each phase is separated by short periods of normal mood. This diagnosis is excluded if the patient has had either a manic episode or a major depressive episode.
Social immaturity	Unable to use or interpret age appropriate social language.
Obsessive compulsive disorder	Obsessive-compulsive disorder (OCD) is a psychiatric disorder most commonly characterized by a subject's obsessive, distressing, intrusive thoughts and related compulsions (tasks or "rituals") which attempt to neutralize the obsessions. Thus it is an anxiety disorder.
Generalized anxiety disorder	Generalized Anxiety Disorder, GAD, is an anxiety disorder characterized by chronic anxiety, exaggerated worry and

	tension, even when there is little or nothing to provoke it.
Phobias	A phobia, is an irrational, persistent fear of certain situations, objects, activities, or persons. The main symptom of this disorder is the excessive, unreasonable desire to avoid the feared subject. When the fear is beyond one's control, or if the fear is interfering with daily life, then a diagnosis under one of the anxiety disorders can be made.
Severe startle response	The startle reaction, also called startle response or alarm reaction, is the response of mind and body to a sudden unexpected stimulus, such as a flash of light, a loud noise, or a quick movement near the face. In human beings, the reaction includes physical movement away from the stimulus, a contraction of the muscles of the arms and legs, and often blinking. It also includes blood pressure, respiration, and breathing changes. The muscle reactions generally resolve themselves in a matter of seconds. The other responses take somewhat longer. An exaggerated startle reaction is also called hyperexplexia (also hyperekplexia).

Immunologic

Frequent upper respiratory infections	The upper part of the respiratory system includes the ears, nose, sinuses, mouth, and throat. It also includes the main bronchi or windpipes, which are the air-carrying tubes in the chest. The upper respiratory system is the most commonly infected area in the body. The term upper respiratory infection (URI) includes the common cold, sore throats, and flu. URIs are usually caused by a virus but may also be due to bacteria or other organisms. An upper respiratory infection is rarely serious but often causes bothersome symptoms.
Frequent lower airway disease (pneumonia, bronchitis)	The lower airway is the airway from the inferior end of the larynx to the ends of the terminal bronchioles. Lower respiratory tract infections (LRTI) are commonly classified as either bronchitis or pneumonia. Bronchitis is inflammation of the bronchi (medium-size airways) in the lungs. Bronchitis is usually caused by viruses or bacteria and may last several days or weeks. Bronchitis is characterized by cough and sputum (phlegm) production and symptoms related to the obstruction of the airways by the inflamed airways and the phlegm, such as shortness of breath and wheeze. Pneumonia is an illness of the lungs and respiratory system in which the alveoli (microscopic air-filled sacs of the lung responsible for absorbing oxygen from the atmosphere) become inflamed and flooded with fluid. Pneumonia can result from a variety of causes, including infection with bacteria, viruses, fungi, or parasites. Typical symptoms associated with pneumonia include cough, chest pain, fever, and difficulty in breathing.
Reduced T cell populations	T-cells are a type of immune cell. The specialized roles of T-cells are (1) to directly attack foreign antigens such as viruses, fungi, or transplanted tissues, and (2) to act as regulators of the immune system. T-cells develop from stem cells in the bone marrow, the immature cells migrate to the thymus. Within the thymus, immature lymphocytes develop

	into mature T-cells (the “T” stands for the thymus). The thymus is essential for this process, therefore in children with VCFS who have hypoplasia of the thymus the T-cells cannot mature at the level needed for the immune system to function efficiently resulting in immune deficiency.
Reduced thymic hormone	One of the hormones produced by the thymus that are believed to play a role in the maturation of T-lymphocytes and overall modulation of the immune system.

Endocrine

Hypocalcemia	Abnormally low level of calcium in the blood; associated with hypoparathyroidism or kidney malfunction or vitamin D deficiency
Hypoparathyroidism	A condition in which the body produces excessive amounts of parathyroid hormone (PTH) disrupting the regulation of calcium. As a result, calcium is taken from the bones; blood levels of calcium rise; and increased amounts of calcium may be excreted in urine
Hypothyroidism	Too little thyroid hormone. Symptoms include weight gain, constipation, dry skin, and sensitivity to the cold. Also called underactive thyroid.
Mild growth deficiency, relative small stature	Slower than normal growth rate and smaller than normal stature
Absent, hypoplastic thymus Missing or small thymus	Missing or small thymus
Small pituitary gland (rare)	Where the Pituitary Gland is smaller then the average. A rare malformation of the pituitary gland

Skeletal/Muscle/Orthopedic - The vertebral column is composed of a series of 31 separate bones known as vertebrae. There are seven cervical or neck vertebrae, 12 thoracic vertebrae, and five lumbar vertebrae. The sacrum is composed of five fused vertebrae, and there are two coccygeal vertebrae which are sometimes fused.

Scoliosis	scoliosis is defined as a lateral curvature of the spine, the presence of which is abnormal.
Spina bifida occulta	Spina bifida (Latin: "split spine") is a developmental birth defect involving the neural tube: incomplete closure of the embryonic neural tube results in an incompletely formed spinal cord. In addition, the bones of the spine (vertebrae) overlying the open portion of the spinal cord do not fully form and remain unfused and open. Spina bifida occulta is the mildest form of spina bifida. It is not as easily detected because skin covers the spinal deformity and any associated abnormalities of the spinal cord and its nerve roots. It can affect any level of the spine, but is usually found in the lower part of the back. Although there are generally no particular symptoms, there are a few characteristics that are common to the condition: • A small dimple in the skin along the spine - these are usually (but not necessarily) found in the lumbar/ sacral region of the spine • A small dimple with numerous long thick hairs growing out of it • fat pat over the occulta or at the base of the spine

Hemivertebrae	Congenital malformation of the spine in which only half of a vertebral body develops. Among the congenital vertebral anomalies, hemivertebrae are the most likely to cause neurologic problems. They are wedge shaped vertebrae, and therefore can cause an angle in the spine. The most common location is the midthoracic vertebrae, especially the eighth (T8). Neurologic signs result from severe angulation of the spine, narrowing of the spinal canal, instability of the spine, and luxation or fracture of the vertebrae. Commonly referred to as "butterfly" vertebrae.
Butterfly vertebrae	As above
Fused vertebrae (usually cervical)	The fused vertebrae act as “one” solid bone, allowing virtually no movement between the fused vertebrae and reducing spinal flexibility to some extent.
Osteopenia	Osteopenia refers to bone mineral density (BMD) that is lower than normal peak BMD but not low enough to be classified as osteoporosis. Bone mineral density is a measurement of the level of minerals in the bones, which indicates how dense and strong they are. If your BMD is low compared to normal peak BMD, you are said to have osteopenia. Having osteopenia means there is a greater risk that, as time passes, you may develop osteoporosis.
Sprengel's anomaly, scapular deformation	Congenital elevation of the scapula with rotation of its lower angle toward the spine. Scoliosis is frequently present, and torticollis may occasionally be associated. The abnormality may be unilateral or bilateral. Abduction of shoulder beyond 90 degrees is impossible. It is due to failure of descent of the scapula during embryonic development from its position in the neck to its normal position in the posterior thorax.
Talipes equinovarus	Congential talipes equinovarus (or club foot) is a birth deformity of the foot. In a clubfoot the bones in the front part of the foot are misaligned. There are several variations of the deformity, but in 95 percent of cases the front half of the foot turns in and down.
Small skeletal muscles	Skeletal muscle is a type of striated muscle, usually attached to the skeleton. Skeletal muscles are used to create movement, by applying force to bones and joints; via contraction. They generally contract voluntarily (via somatic nerve stimulation), although they can contract involuntarily through reflexes.
Joint dislocations	A dislocation is a separation of two bones where they meet at a joint. (Joints are areas where two bones come together.) A dislocated bone is no longer in its normal position. A dislocation may also cause ligament or nerve damage.
Chronic leg pains	Chronic leg pain can be a dull, nagging pain or a sharp, intense pain. See booklet for a full description of leg pain in relation to VCFS
Flat foot arches	Flat feet is a condition in which the foot doesn't have a normal arch. It may affect one foot or both feet. At first, all babies' feet look flat because an arch hasn't formed yet. Arches should form by the time your child is 2 or 3 years old. Flat feet, even in older children, usually do not cause any problems. There's an easy way to tell if you have flat feet. Simply wet your feet, then stand on a flat, dry surface that will leave an imprint of your foot. A normal footprint has a

	wide band connecting the ball of the foot to the heel, with an indentation on the inner side of the foot. A foot with a high arch has a large indentation and a very narrow connecting band. Flat feet leave a nearly complete imprint, with almost no inward curve where the arch should be.
Hyperextensible/lax joints	Joints that extend beyond the typical range or come apart or slip out of alignment
Rib fusion	Ribs are the long curved bones which form the rib cage. Ribs surround the chest, and protect the lungs, heart, and other internal organs of the thorax. Fused ribs means two or more ribs are joined together. This typically causes curvature of the spine toward the area of involvement.
Extra ribs	A cervical rib is a supernumerary (extra) rib which arises from the seventh cervical vertebra. It is a congenital abnormality located above the normal first rib. A cervical rib is present in only about 1 in 200 (0.5%) of people; in even rarer cases, an individual may have not one but two cervical ribs. The presence of a cervical rib can cause a form of thoracic outlet syndrome due to compression of the brachial plexus or subclavian artery. Compression of the brachial plexus may be identified by weakness of the muscles around the muscles in the hand, near the base of the thumb. Compression of the subclavian artery is often diagnosed by finding a positive Adson's sign on examination, where the radial pulse in the arm is lost during abduction and external rotation of the shoulder.
Tethered cord	In tethered spinal cord syndrome, the lower end of the spinal cord stays attached to the base of the spine, rather than riding freely up and down the spinal canal. Since the spine grows faster than the spinal cord, this leads to increasing stress on the spinal cord as a child grows and becomes more active. Symptoms such as weakness in the legs, low back pain and incontinence may be the first signs of this condition, which is closely related to spina bifida.
Syrinx	A syrinx is a fluid-filled cavity that develops in the spinal cord (called a syringomyelia), in the brain stem (called a syringobulbia), or in both. Syrinxes are rare. In about half of the people who have a syrinx, it is present at birth, and then for poorly understood reasons, it enlarges during the teen or young adult years.

Skin/Integument

Abundant scalp hair	Excessive hair on the head
Thin appearing skin	venous patterns easily visible

Secondary sequences/associations – see booklet for a discussion on the difference between a syndrome and a sequence.

Pierre Robin sequence	Pierre Robin sequence is a combination of problems that begins during pregnancy with micrognathia (small jaw). If the jaw is small, there is often not enough room for the tongue to lie flat in the mouth, so it rests at the back of the mouth (this is called glossoptosis). When the tongue rests at the back of the mouth, it may prevent the palate (roof of the mouth) from closing, resulting in a cleft palate (cleft lip is not usually

	associated with Pierre Robin). The falling back of the tongue may cause choking episodes and feeding and breathing difficulties, especially when the child sleeps. In summary Pierre Robin sequence consists of: • Very small jaw with marked receding chin • Large-appearing tongue in relation to jaw • Jaw placed unusually far back in the throat • High-arched palate • Cleft soft palate • Small opening in the roof of the mouth, which causes choking • Natal teeth (teeth appearing when the baby is born)
DiGeorge sequence	This is a congenital absence of the thymus and parathyroid glands, along with conotruncal heart defects. This anomaly leads to increased risk of infections (immune deficiency), low blood calcium (hyopcalcemia), and delayed development. The most common immunodeficiency in DiGeorge sequence patients is defects in T-cell production due to insufficient thymic tissue. However, because T-lymphocytes are important in regulating antibody responses, DiGeorge sequence is no longer regarded as a pure deficiency of cellular immunity but also a form of variable-combined immunodeficiency.
Potter sequence	Potter's sequence is one of several serious or fatal kidney abnormalities such as bilateral renal agenesis (BRA), renal hypoplasia, polycystic or multicystic kidney diseases or obstruction of the urinary tract, In Potter sequence the baby's kidneys do not develop in the first few weeks of life in the womb. The baby's kidneys are essential for the production of amniotic fluid in the womb. If there are no or underdeveloped kidneys, there is little (oligohydramnios) or no amniotic fluid (anhydramnios) to expand the womb around the baby and to allow the baby to grow and move. The womb remains small and in its confined space the baby's lungs cannot develop properly. Many babies with Potter sequence are stillborn. In those who are born alive, the immediate cause of death is failure to breathe (respiratory failure) due to underdeveloped (hypoplastic) lungs, usually one or two days after delivery. Even if this problem is treated the baby cannot survive without kidney.
CHARGE association	This anomaly is characterized by the presence of coloboma or choanal atresia and three of the following defects: congenital heart disease, nervous system anomaly or mental retardation, genital abnormalities, ear abnormality or deafness. If both coloboma and choanal atresia are both present, only two of the additional (minor) abnormalities are needed for diagnosis.
Holoprosencephaly (single case)	Holoprosencephaly is a disorder caused by the failure of the prosencephalon (the embryonic forebrain) to sufficiently divide into the double lobes of the cerebral hemispheres. The result is a single-lobed brain structure and severe skull and facial defects. In most cases of holoprosencephaly, the malformations are so severe that babies die before birth. In less severe cases, babies are born with normal or near-

	normal brain development and facial deformities that may affect the eyes, nose, and upper lip. There are three classifications of holoprosencephaly. Alobar, in which the brain has not divided at all, is usually associated with severe facial deformities. Semilobar, in which the brain's hemispheres have somewhat divided, causes an intermediate form of the disorder. Lobar, in which there is considerable evidence of separate brain hemispheres, is the least severe form. In some cases of lobar holoprosencephaly the baby's brain may be nearly normal.

Some other facts about the syndrome:

Population prevalence (estimated): 1:2,000 people
Birth incidence (estimated): 1:1,800 births
Most common microdeletion syndrome
Second most common genetic syndrome
Most common syndrome associated with cleft palate
Second most common syndrome associated with congenital heart disease