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# Common infectious diseases in children aged 0-5 years, and treatment at home

A guidebook for parents and health care professionals

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#### ABSTRACT

The purpose of this thesis is to improve the decision-making skills of parents to reduce unnecessary visits to hospital or reduce anxiety caused by the situation by increasing the knowledge to gain good awareness and self-confidence in the situation.

The aim of this project is to provide useful information for parents in Finland by creating a guidebook; to help them to be familiar with home treatment, assessment, and severity of infectious diseases in children aged 0-5 years which can cause confusion and distress among parents as well as to support health care professionals in guiding the parents, and also to increase our own knowledge.

The thesis is a functional thesis and it is produced in English for Päijät-häme social and health care group's Acute 24 –emergency unit in Finland.

The main questions considering the thesis are: When one should contact a health care professional if an infant has common cold, influenza, sinusitis, pneumonia, bronchitis, otitis media, conjunctivitis, stomatitis, fungal infection of the groin, acute abdominal pain or acute gastroenteritis, and what is the home treatment for those? Qualitative research method is used to find out information about the common infectious diseases in infants.

Key words: infant, infection, guide, infectious diseases, children, family, parents

Lahden ammattikorkeakoulu  
Hoitotyön Koulutusohjelma

NURMIO, AKSELI & NOTERMAN, HENRY:

Yleiset infektioaudit 0-5 vuotiailla lapsilla ja niiden kotihoito: Opas vanhemmille ja terveydenhuollon ammattilaisille

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Opinnäytetyön tarkoituksena on vähentää tarpeettomia käyntejä sairaaloihin ja samalla myös ehkäistä epätietoisuudesta aiheutunutta ahdistusta lisäämällä vanhempien tietämystä lasten infektiotaudeista.

Tavoitteena opinnäytetyössä on tarjota vanhemmille hyödyllistä tietoa lasten infektiotaudeista oppaan avulla. Opas antaa tukea 0-5 vuotiaiden yleisten infektioautien kotihoitoon ja seurantaan, jotka voivat aiheuttaa ahdistusta ja hämmennystä lasten vanhempien keskuudessa. Opasta voivat myös hyödyntää terveydenhuollon ammattilaiset ohjeistaessaan vanhempia sekä potilasta.

Opinnäytetyö on toiminnallinen opinnäytetyö ja se on toteutettu englannin kielellä. Opas tuotetaan Päijät-Hämeen sosiaali- ja terveystyhtymän Akuutti24 – yksikön käyttöön.

Keskeisimmät kysymykset opinnäytetyössä ovat: Milloin terveydenhuollon ammattilaiseen tulisi ottaa yhteyttä kun lapsella epäillään tai on flunssa, influenssa, poskiontelun tulehdus, keuhkokuume, keuhkoputken tulehdus, välikorvan tulehdus, silmän sidekalvon tulehdus, suun infektio, äkillinen vatsakipu tai suolistotulehdus?, Mikä on yleisten lasten infektioautien kotihoito?

Asiasanat: lapsi, imeväinen, infektio, ohjeistus, infektioaudit, perhe, vanhemmat

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## 1 INTRODUCTION

Infections are the leading diseases in children (Jalanko 2009; Huttunen 2002, 79), and especially common in infancy. All children get infectious diseases and statistically they are the most overwhelming reason for sick leaves in school and day care. The most common infection is viral upper respiratory infection, which a small child has multiple times in a year. A child who has started a day care can cough and sniffle several weeks afterwards. The consequential disease for rhinitis is otitis media which can cause the child to end up having several ear infections in a row, causing sleepless nights and several antibiotic treatments. (Jalanko 2009.)

In addition to respiratory infections, diarrheal diseases, skin infections, and poxes occur in children especially in wintertime. It is remarkable that many epidemics and serious infections in Finnish children have reduced or completely vanished. Particularly the introduction of haemophilus vaccine in 1980's has reduced infections of meninges and epiglottis as well as some other life-threatening infections to minimum. Vaccinations are the most effective and safest way to ensure the health of Finnish children. (Jalanko 2009.)

In this thesis we have gathered specific information about common diseases and infections in children aged 0 to 5 years and forming a generalization of them including basic knowledge about the diseases. The guidebook based on the information collected in the thesis is given to Päijät-Häme social and health care group's Acute24 – emergency department. It supports infant's parents to understand possible diseases and infections better which can occur in the childhood. The guidebook is meant for health care professionals also to support their knowledge of the pediatric infections when providing guidance to a patient or parents'. Guidebook was written in English to provide information for the international clients in hospital environment; it can be translated to other languages in the future depending on the needs.

The guidebook is about common infectious diseases in children and their treatment for parents who are new with the situation and are not aware how to act when a child is sick. By the word usable we mean that the guidebook will include all the necessary information and knowledge about the common infectious diseases in children which could help a new parent to make decisions about applying to a hospital or not, and to support their ability to take care of sick child at home. The guidebook is also usable for health care professionals by supporting their knowledge and as a method for teaching parents, especially parents who are incapable of understanding Finnish language and prefer English instead. Oral and written guidance support each other and a successful guidance of the patients can decrease the length of care and amount of hospital visits (Torkkola, Heikkinen & Tiainen 2002, 24). The criteria of the guidebook was to keep it well summarized and understandable for everyone; The content was made clear and simple by using easily understandable words which a person with lower English language skills understand. It is important to know that the idea of the guidebook is to support parents in understanding the child without health care professionals' assistance and it should not be used as an excuse for leaving the child without care, which why contact informations for professional help are provided.

We are young adults and parents, and know that a new parent has no experience in treating children of his/her own. Many of the pediatric patients applying for acute care are not in need of acute care or treatment at all even though parents are worried about their child's current health status. Based on the interviews by Finnish newspapers, chief medical officers in different hospitals and deputy of ministry of social affairs and health has estimated that 20% of the people who apply to emergency care in Finnish hospitals are not in need of emergency treatment, and could be treated somewhere else (Nieminen 2014; Kykkänen & Lassheikki 2013). This burdens emergency department and may prevent people in need of acute medical care from not getting it (Kykkänen & Lassheikki 2013). Based on the statistics, new parents need a guidebook to learn about the common infectious diseases in children, homecare, and assessment of the child's health status.

## 2 COMMON INFECTIOUS DISEASES IN CHILDREN AND INFECTION CAUSING PATHOGENS

A study in which 7000 Finnish children's health status were controlled for a year show that at least every tenth child have rhinitis and every twentieth boy has diarrhea or otitis media. Finnish children experience over 2 million infectious diseases a year. (Rajantie, Mertsola & Heikinheimo 2010, 175.) It is estimated that infectious diseases cause over 14 million deaths each year in children aged 0-5 years. In Finland infections are a rare cause of death in children but they cause massive increase in sicknesses and financial losses for families and for the whole society. (Huttunen 2002, 79.)

Infectious diseases are diseases caused by pathogens, micro-organisms that infiltrate the body causing different type of diseases, according to the pathogen. Pathogen is a micro-organism that causes diseases. These pathogens might be bacteria, fungi or viruses. (Lumio 2014a.) An infectious disease always causes an inflammatory response in the body. The infecting micro-organism causes the immune system to response. It may show as local inflammation in the mucous membranes, e.g. in the bronchus (bronchitis) or as a change in the number of white blood cells in the bloodstream. White blood cells, leukocytes increase in number when the body detects a foreign particle or organism and an inflammatory response is the human body's normal way of combating invading micro-organisms, by increasing the number of white blood cells in the bloodstream. (Jalanko 2009, 49-50.)

### 2.1 Infection causing pathogens

Infections are caused by microbes. Cold, draft of air, stress, vigil, lack of vitamins or bad eating may increase the strength of symptoms but do not cause the infections. A microbe is always required which most often is transmitted from person-to-person. Microbes normally live on people's mucous membranes, e.g. skin, mouth, throat and intestines and often the infection is caused by a microbe of one's own. (Jalanko 2003, 35.)

### 2.1.1 Bacteria

Bacterial infections are caused by bacteria, which enter the body and try to conquer living space by producing toxins. Bacteria are single cell organisms that resemble the structure of a human cell, with certain differences such as a hard outer shell, making them more resilient to the environment. There are a lot of bacteria living inside our body such places as our gut and on our skin. These are so called “good bacteria”. There are also millions of bacteria that are caught on the mucous membranes of the nasal cavities or the respiratory tracts. This is the body’s primary defence against invading micro-organisms. Because bacteria have a hard shell that makes some of them able to survive even the toughest environments such as the acidity of the stomach. Some antibiotics target the bacterial shell, such as penicillin, that damages the hard cellular wall of the bacteria, killing the bacteria. (Jalanko 2009, 51-52.) Some bacteria may transfer themselves into a dormant state or spore, which can survive extreme environment, such as high temperature or long periods of drought and hatch when they find themselves in a good living environment; e.g. the human body. (Lumio 2013.)

### 2.1.2 Viruses

Viruses’ differ from bacteria by not having a cellular structure; instead they are ball like spheres, made up of proteins and DNA. One thousandth of a millimetre in size, they enter the body and once they find their target cell for example a cell in the nasal cavities, they take over the cell, forcing it to produce parts of new viruses, killing the cell. This causes the cell to send a signal to the immune system, which then causes an autoimmune response, inflammation. Viruses differ from bacteria and fungi by not having a clear cellular structure and so are not considered living organisms though they do reproduce in their host. (Lumio 2013.) Viruses have the potential to mutate rapidly so the number of different viruses is theoretically limitless. There are about a dozen of different viruses that infect children. (Jalanko 2009, 50-51.)



### 2.1.3 Fungi

From all known fungal species, about 200 species cause infections to humans. Most commonly infecting fungal species are the *Candida*- and *Aspergillum* species. (Lumio 2013.) Most common infection is a yeast-infection on the skin around the groin, gluteal cleft, arm pits and under the breasts caused by *Candida albicans*. *Candida albicans* is also the most common cause of vaginitis. Fungal infections are more prone to emerge after antibiotic treatment caused by the loss of the body's own bacterial flora. (Hannuksela 2012.)

## 2.2 Respiratory infections

Infection of the airways can be categorised into upper and lower respiratory tract infections. The upper airway consists of the mouth, throat and nasal cavities (oronasopharynx), pharynx, larynx and the upper part of the trachea. The lower respiratory tract consists of the rest, lower trachea, bronchus and the lungs and alveoli. The infection is then named by the area of the respiratory tract where the infection occurs, e.g. bronchitis means the infection of the bronchus. (Hockenberry & Wilson 2013, 707.)

### 2.2.1 Common cold

Common cold, also known as nasopharyngitis, is the infection of the upper airways consisting of the nasal cavities and the pharynx. Usually the cold begins with either a blocked nose or throat pain, or both. Usually the cold lasts for about 7 to 12 days, where most of the symptoms have cured. A cough, caused by the cold may continue longer, seven to fourteen days and up to 3 weeks without being a case of a post nasopharyngital bacterial infection. (Hockenberry & Wilson 2013, 710; Jalanko 2009, 66-67.)

Common cold is not caused by exposure to cold as thought by many; instead it is caused by a variety of viruses, over 200 to be exact. Of these viruses the most common ones to cause the common cold are a variety of adenoviruses, rhinoviruses, coronaviruses, enteroviruses, influenza viruses and parainfluenza

viruses. Also RS-virus causes the common cold, though it might later lead to bronchitis. (Hockenberry & Wilson 2013, 710; KinyonMunch 2011; Jalanko 2009, 61-62.)

Symptoms of the common cold vary per person. Most common symptoms are local to the upper respiratory tracts, symptoms such as a blocked or runny nose, throat pain or pain while swallowing and coughing. Other symptoms may include fever and joint pain. Symptoms mainly last from seven to twelve days. The coughing and a blocked nose may cause the child to wake up at night caused by mucous running into the trachea from the nasal cavities. (Jalanko 2014b; 2009, 66-67; KinyonMunch 2011.)

There is no medical cure for the common cold and each symptom is treated separately. This is due to the amount of different viruses that cause the common cold and also the rapid mutation of the viruses that cause the disease rendering the development of a vaccine to prevent the disease nearly impossible. (Jalanko, 2014b.) Nearly all colds are cured by themselves even without pharmaceutical care, though medication may be used to alleviate the symptoms of the common cold. With infants, a couple of drops of saline may be dropped into the child's nasal cavities and gentle suction may be used by a specific tool, which is available from most pharmacies, to remove mucous from the nasal cavities to alleviate the discomfort of a blocked nose. (KinyonMunch 2011.) Antibiotic treatment does not work, for the disease because it is caused by a virus (Jalanko 2009, 62).

The child should be taken to be examined by a doctor when the child has; fever that lasts over five days, the child's eyes start to secrete more than normally, the child's breathing begins to sound wheezy, highly frequent and puffy. Child has high fever, especially infants, and seems to be more tired than normally. The fever goes down and rises again. Also a child is good to be taken to be examined when he seems to be painful and wakes up frequently at night time or the cold continues for more than two weeks. The main point is to monitor the child's overall condition and if the child seems to be excessively tired and unwell, should he be taken to be examined by a doctor. (Jalanko 2014b; 2009, 66-67; Hockenberry & Wilson 2013, 707.)

### 2.2.2 Influenza

Symptoms of influenza or the flu, which it is also known, are cold like symptoms such as joint pain, fever, cough and a blocked nose (Jalanko 2009, 66-67). Most distinguished features or symptoms of influenza are high fever and muscle aches which are more severe than in the case of a common cold (Lumio 2014b).

Influenza is the infection of the upper airways in other words the virus attacks the cells of the nasal cavities and the pharynx. Influenza is caused by three different kinds of orthomyxoviruses; A, B and C which are separated by their antigenic distinction. Types A and B are responsible for the annual influenza epidemics. (Hockenberry & Wilson 2013, 716-717.) Influenza is spread by the respiratory secretions such as mucous or sputum, which is released when a person infected with an influenza virus coughs or sneezes (Nohynek & Ikonen 2015). The incubation time of influenza is one to two days before the outbreak of symptoms (Lumio 2014b). Small children, age under two years old are more at risk of having an outbreak of influenza than older children (Terveyden ja hyvinvoinnin laitos 2011).

The reduced respiratory ventilation caused by the inflamed upper airways causes a heightened risk of contracting a bacterial infection of the lower respiratory tracts and the lungs. This is the primal reason for hospitalization among small children with influenza. Influenza is also most severe with children under the age of 3 years. Most cases of hospitalization are due to breathing difficulties, high fever, and acute otitis media and in the worst case sepsis. (Silvennoinen 2012.) Influenza may be treated with antiviral medication such as oseltamivir (Tamiflu®), which alleviates the symptoms of influenza and reduces its infectivity (Raus et al. 2015). Also tamiflu is found to lower the risk of complications caused by influenza (Lumio 2014b). The best way to protect one's child from influenza is to get child vaccinated. Vaccination does not give 100% immunity to the disease due to the fact that influenza viruses mutate rapidly, but is found to substantially decrease the risk of contracting influenza that vaccination is recommended. Vaccination not

only prevents the outbreak of influenza but also decreases the infectivity of the disease for a vaccinated child lowers the spreading of influenza. (THL 2011.)

With influenza as well as with the common cold, a child should be taken to be examined by a doctor if he is under 35 months' old, has high fever, is exceedingly tired, the disease is prolonged or he seems to be painful and wakes up frequently at night. Also breathing difficulties are an indication that the child should be taken to hospital. (Jalanko 2014b; Silvennoinen 2012.) In most cases influenza is cured by itself in a week's time with rest and symptom alleviating care (Hockenberry & Wilson 2013, 716-717).

### 2.2.3 Sinusitis

Sinusitis means the infection of the sinus, a cavity, which links the otitis media to the nasal cavities (Jalanko 2009, 91). The symptoms with acute sinusitis are more or less the same as with the common cold. Symptoms are pus-like secretion from the nasal cavities, pain in the cheeks and face especially when leaning forward. Other symptoms may include distorted sense of smell and a headache that is contained on one side of the head. (Jalanko 2009, 91; Blomgren & Pitkäranta 2004.) Sinusitis is usually associated with upper airway infections such as the common cold and influenza and the symptoms of acute sinusitis are commonly hard to differentiate from the common cold (Blomgren & Pitkäranta 2004). Symptoms that last up to 10 days or severe symptoms that last from three to four days are an indication that the child might have sinusitis (Käypä hoito 2013).

Sinusitis is result of bacteria in most cases but also in rarer cases fungi being trapped into the sinus by a blockage to the normal flow of air and secretions through and the nasal cavities to the pharynx and vice versa. The microbes trapped in the sinus cause pressure to build up causing discomfort to the child. (Raz et al. 2015; Jalanko 2009, 91.)

Because the sinus develop slowly, infections of the sinus are rare with children under the age of 3. Diagnosing sinusitis is difficult because clinical findings are hard to determine. This is because with children less than 6 years old the sinuses seem blocked in radiological findings even though there would not be a case of

sinusitis. (Käypä hoito 2013.) Laboratory studies show that the C-reactive protein (CRP), which in most cases is an indication of an inflammation, might not be heightened in patients with acute sinusitis (Blomgren & Pitkäranta 2004). With children under the age of 3, findings that suggest that the patient has sinusitis might be otitis media. This is due to the close proximity of the developing sinus and the middle ear. (Jalanko 2009, 91.)

Treatment of acute sinusitis is commonly started with nasal dilating sprays, which reduces the pressure in the sinus and eases the outflow of secretions out of the sinus (Jalanko 2014f). Treatment of the symptoms of sinusitis is enough in most cases when the symptoms of sinusitis are associated with flu like symptoms. Pain medication, mucous membrane decongestant nasal sprays and antihistamines reduce the symptoms of upper airway infections. (Käypä hoito 2013.) Acute bacterial infections of the sinus are typically treated with antibiotics but also saline irrigation of the sinus which has also been found to be good treatment method of sinusitis (Raqab et al. 2015; Käypä Hoito 2013; Blomgren & Pitkäranta 2004).

For the antibiotic treatment to be started must there be a clinical finding of the type of bacteria infecting the sinus. In most cases sinusitis is caused by pneumococcus. (Jalanko 2009.) Children, whose sinusitis symptoms continue over 10 days, get worse after 5 days or the symptoms are severe benefit the most from antibiotics. Antibiotics used are in most cases V-penicillin or amoxillin. If the primary antibiotic treatment of severe acute sinusitis does not work, mechanical removal of secretion of the sinus by paracentesis may be used and antibiotic treatment continued. (Käypä hoito 2013.)

A child should be taken to a health care professional if the child becomes feverish or the sinusitis causes ache on the forehead or between the eyes (Jalanko 2014f). If the symptoms disappear it is not necessary to seek treatment (Käypä hoito 2013).

#### 2.2.4 Pneumonia

Pneumonia means the infection of the lungs by a microbe. The infection causes fluid and inflammatory waste to accumulate into the lungs, covering alveoli and inhibiting gas change in the lungs causing breathing problems. (Hockenberry & Wilson 2013, 725-726.) Pneumonia is a relatively rare lower respiratory tract infection in Finland. Around four percent of children under the age of five years are annually struck by pneumonia in Finland. Annual total of pneumonia cases are around 60 000 in Finland. (Siimes & Petäjä 2007, 170.) Pneumonia is caused either by bacteria such as pneumococcus or staphylococcus. Usually associated as a complication of a previous upper airway infection such as influenza. (Hockenberry & Wilson 2013, 725.) Viral pneumonia is mainly caused by RS-virus or influenza viruses. *Mycoplasma pneumoniae* also is a major cause of pneumonia, but is more common with children over six years old. (Käypä hoito 2014; Siimes & Petäjä 2007, 172.) The ratio of bacterial pneumonia and mycoplasma caused compared to viral pneumonia is around 50/50 (Hockenberry & Wilson 2013, 725-726).

The infection in the lungs causes tiredness, fever, coughing and heightened breathing ratio with chest indrawing. In some cases there might be chest pain whilst coughing and bloody sputum in the worst cases. (Hockenberry & Wilson 2013, 725-726; Siimes & Petäjä 2007, 170-171.)

If a parent suspects that the child is more tired than usual and has fever, should the child be taken to be examined by a health care professional (Rajantie et al. 2010, 206-207). Also when the fever and cough get worse, feverish child's breathing ratio is high, there is blood in sputum or if the cough lasts for over two weeks (Rajantie et al. 2010, 206-207; Jalanko 2009; 2003, 78).

It is hard to distinguish a viral pneumonia from a pneumonia caused by bacteria or mycoplasma (Rajantie et al. 2010, 206-207). Usually viral pneumonia is found in the upper part of the lung or near the bronchus whereas bacteria colonize the lower and mid section of the lung (Siimes & Petäjä 2007, 172). Blood tests dare not found to distinguish apart viral and bacterial pneumonia reliably. C-reactive protein test helps to diagnose if the child has bacterial pneumonia but in some

cases the CRP might be low even though bacteria are infecting the lungs. (Rajantie et al. 2010, 206-207; Siimes & Petäjä 2007, 172.)

Auscultations of the lungs with the blood tests are indicators to which the doctor might make his diagnose upon. If the doctor has doubts, the best way to confirm a suspected pneumonia is to take a thorax x-ray. In the x-ray, infection mass can be clearly seen as a shadow in the lung, which usually confirms a case of pneumonia. (Käypä hoito 2014; Rajantie et al. 2010, 206-207; Siimes & Petäjä 2007, 172-173.)

Children in Finland are vaccinated against pneumococcus since 2010 (Jenu et al 2014, 1445-1451) and this is why major case of children's pneumonia under the age of four are caused by viruses. Though bacterial pneumonia is rare with small children, antibiotic treatment is still used to treat pneumonia. This is because the pathogen causing pneumonia is hard to determine without an invasive sample. (Käypä hoito 2014; Rajantie et al. 2010, 206-207.) The prognosis with antibiotic treatment started is the same regardless the pathogen causing pneumonia (Siimes & Petäjä 2007, 174-175).

If the symptoms are not severe and the child is not in critical condition, pneumonia can be treated at home with antibiotics and rest with a good prognosis. In severe cases the child is hospitalized to receive i.v antibiotic treatment. (Käypä hoito 2014; Siimes & Petäjä 2007, 175.) Pneumococcus vaccinations have also prevented the upcoming of penicillin resistant pneumococcus caused pneumonias and are in key of preventing pneumonia (Käypä hoito 2014).

### 2.2.5 Bronchitis

Bronchitis is the infection of the bronchi, the airways leading from the trachea to the lungs. The infection causes the bronchi to swell due to inflammation in the bronchus. This causes airflow to be partially obstructed caused by mucous on the surface of the bronchi. This then leads to a lowered ventilation of the lungs. (Jalanko 2009, 105-106.) Bronchitis is more common with children who have an obstructive bronchial disease such as asthma for the already constricted bronchi heighten the possibility of anaerobic bacteria, in most cases pneumococcus, to

colonize the surface of the bronchi (Kompare & Weinberger 2012). Acute bronchitis with healthy children is commonly caused by RS-virus or rhinovirus (Skjerven et al. 2015; Lumio 2012).

Because bronchitis is usually associated with a prolonged cold or flu, symptoms of bronchitis are similar with the common cold; fever and extensive coughing. Characteristic symptoms of bronchitis are noisy, wheezing breathing, high fever and dry cough. Wheezing is caused by the airflow through the constricted bronchi. (Kompare & Weinberger 2012; Lumio 2012.)

The symptoms of bronchitis are enough for the parent to take their child to be examined by a doctor. Bronchitis is diagnosed by clinical findings. These include auscultation of the lungs and blood tests to find out if there is a case of inflammation. (Jalanko 2014a; 2014d.) If there is no clear marker that the coughing and wheezing breathing is caused by a microbe, might the child have a case of asthma, which to be diagnosed needs further assessment (Kalliola 2015).

Depending on the severity of bronchitis, the child is either hospitalized or the disease can be managed at home. If the bronchitis is caused by bacteria, may an antibiotic treatment be required. In most cases more severe bronchitis is caused by a virus. In these cases treatment of the symptoms is a key to recovery. (Jalanko 2009, 109-110.) If the child is feeling well and has no breathing difficulties a specific treatment is not required because a viral bronchitis should heal by itself within 1-2weeks (Jalanko 2009).

Hydration of the child is important in treating bronchitis. This is so that the mucous can be more easily coughed up by the child (Lumio 2012). In more severe cases which have lead to hospitalization, ephedrine or adrenaline inhaled may be used to dilate the bronchi to increase the airflow to and out of the lungs to increase the oxygen saturation in children, especially infants (Flores-González et al. 2015; Sjerven et al. 2015). Viral bronchitis is self curable like all viral diseases. This is why treatment of symptoms is the key in managing the disease (Jalanko 2009).

A child should be taken to a doctor if the child is less than six months old and has progressive cough, rhonchus and breathing difficulties, tiredness and is eating



poorly; infant has severe fit of coughs or apnea; if suspected that a child has swallowed a toy or foreign object; If child have a hoarse and dull cough, rhonchus during inhalation and breathing difficulties; Child with flu has dense and arduous breathing and wheezing breathing; Coughing child has fever and increasing amount of mucous excretion which last over a week; Child's cough lasts several weeks. (Jalanko 2009; 2003, 76.)

#### 2.2.6 Otitis media

Otitis media means the infection of the middle ear and is one of the most common infections with infants and young children. The infection is mainly caused by bacteria, pneumococcus in particular, trapped in the middle ear by the inflammation of mucous membranes in the nasal cavities and the pharynx. This is mainly caused by an upper airway infection such as the common cold or influenza. 70 per cent of cases of otitis media are caused by bacteria.

(Hockenberry & Wilson 2013, 717; Käypä hoito 2010; Klaukka et al 2006.)

Breast feeding has been found to lower the risk of a child to have otitis media (Käypä hoito 2010; Rajantie et al. 2010, 191).

Symptoms of acute otitis media are mainly the same as with the common cold and influenza. With symptoms such as cough, fever, runny or blocked nose. (Jalanko 2014e.) Most distinguishable symptom of otitis media is pain in the ear and pus like secretion in the ear. The absence of ear pain does not rule out a case of otitis media if the other symptoms match. (Jalanko 2014e; Käypä hoito 2010.)

Restlessness at night time with infants more than with upper airway infections is found to be a symptom of otitis media but does not alone indicate a case of otitis media (Käypä hoito 2010). Ear groping with infants may indicate pain or discomfort in the ear. Older children may express lessened sensation of hearing in the infected ear. Smaller children have difficulties in expressing lessened sense of hearing. This is why lessened sensation of hearing is a marker of possible otitis media and alone is not enough to diagnose acute otitis media. (Käypä hoito 2010.)

Untreated otitis media may lead to permanent hearing damage, damage to the middle ear or may lead to other severe infections such as meningitis or mastoiditis (Penido et al. 2015; Käypä hoito 2010).

A child with symptoms of otitis media should be taken to be examined by a doctor. Otitis media cannot be diagnosed without a doctor inspecting the eardrum of the child with an otoscope. (Käypä hoito 2010; Jalanko 2009a.) Otoscopy is the primary diagnostic examination of a suspected otitis media (Rajantie et al. 2010, 191). A healthy eardrum is pearl gray and moves freely. An infected eardrum does not have free movement caused by secretion developing in the middle ear, pressing the eardrum. The infection also causes redness in the eardrum, though a steady redness of the eardrum develops if the child is crying when the ear is inspected. Acoustic impedance test is used to reliably measure the movement of the eardrum. This though to be accurate needs the child to be still and crying as in diagnosing with an otoscope causes inaccurate findings. (Käypä hoito 2010; Rajantie et al. 2010, 191.) Acoustic impedance test is advised to be conducted with children over 18 months old (Käypä hoito 2010). If the eardrum is perforated or there is pus-like secretion in the ear canal, bacterial cultivation is needed to determine the type of microbe infecting the middle ear for antibiotic treatment (Rajantie et al. 2010, 192-193).

Research indicates that the majority of children with otitis media are cured spontaneously. In cases where the diagnosis is unclear and a doctor cannot reliably diagnose otitis media with otoscopy and acoustic test. (Rajantie et al. 2010, 191.) Pain- and anti-inflammatory medication such as ibuprofen and paracetamol are prescribed to the child and locally anesthetizing eardrops be used to alleviate the pain and discomfort. A control visit to the doctor in two to three days after the first visit is advised so the diagnosis of otitis media can be conducted more reliably. This is to minimize the useless use of antibiotics. (Käypä hoito 2010; Rajantie et al. 2010, 191; Klaukka et al. 2006.)

Pain management is important part of the treatment in children, especially in Otitis media. Pain management is the primary treatment at home. Untreated and intense pain leaves an engram into the child's mind and pain system. Child's pain

should always be prevented. Moderately intense and intense pains always demand intensive treatment. Paracetamol alleviates basic pain satisfyingly but it is not enough if the pain is intense. (Kokki 2012.)

Oral suspension is preferred for the children who are able to take it. In older children dissolving tablets may also be used. Suppositories should be used if oral medication cannot be used; often this means children less than 3 months old. Absorption of the suppositories varies. (Kokki 2012.)

Paracetamol and ibuprofen are common basic medications in pain management. Paracetamol can be given 15mg/kg/dose, a maximum of 60mg/kg/day. Ibuprofen can be given 10mg/kg/dose, a maximum of 40mg/kg/day. Doses should be given a minimum of four hours apart from each other. (Kokki 2012; Heikkinen, Huovinen, Jero, Pitkäranta, Renko, Sumanen & Heikkilä 2010.)

In cases where the secretion in the middle ear causes hearing impairment, especially in cases where both ears are infected or the pain caused by the pressure of secretion in the middle ear is great, is puncturing of the eardrum or the insertion of a ventilation tube into the eardrum advisable (Käypä hoito 2010; Rajantie et al. 2010, 192). This procedure lessens the pressure in the middle ear, lets the secretion to evacuate out of the middle ear and lowers pain in the ear (Rajantie et al. 2010, 192-193). Tonsillectomy may be advised if the child has annual or frequent otitis media (Käypä hoito 2010).

Check up of the child at a doctor in a month's time after the diagnosis and treatment of otitis media is advised (Klaukka et al. 2006). This is due to the fact that even after the otitis media is cured, 5 to 20% of patients have permanent secretion inside the middle ear. In most cases the secretion evacuates out of the middle ear in a month's time. The check up is to minimize the risk of possible complications of otitis media and to discover possible complications before they start to cause harm to the child. (Ruuskanen 2015, 1726-1728; Käypä hoito, 2010; Rajantie et al. 2010, 192-193.)

### 2.2.7 Conjunctivitis

Conjunctivitis also known as pink-eye is the infection of the conjunctiva, a translucent membrane that covers the underside of the eyelid and on the surface of the eye. Conjunctivitis is caused by the same strands of bacteria and viruses which cause the common cold and influenza. Conjunctivitis may also be a symptom of allergies. (Seppänen 2013; Jalanko 2009, 70-71.) All the irritations of the eye are not related to infections. External mechanical factors, e.g. dust may cause symptoms in the eye. In these cases antibiotic treatment is not often required. (Jalanko 2003, 49-50.) Main symptoms of conjunctivitis are redness of the eye, burning sensation in the eye. Bacterial infection also causes pus-like secretion in the corners of the eye. (Seppänen 2013.)

Viral conjunctivitis goes by itself in a few days and does not need treatment (Seppänen 2013; Jalanko 2003, 48). If pus-like secretion from the eye is present it is recommended to wash face with water at least 10 times per day when awake (Rajantie et al. 2010, 254). Lema should be cleansed by wiping with clean and wet cotton in the mornings and before administering eyedrops. Eye secretion is an indication of a bacterial conjunctivitis which may need antibiotic treatment and so to be seen by a doctor. (Seppänen 2013; Rajantie et al. 2010, 254; Jalanko 2009b.) Also if the infection does not start to heal or the eye becomes inflamed, the eye feels painful or sight problems occur, child should be taken to be examined by a doctor (Seppänen, 2013). The infection often relapses in infants (Rajantie et al. 2010, 254).

### 2.3 Infections of the mouth

Mouth infections mean an inflammation of the mucous membranes, gums and lips. The infection can be caused by a virus or fungi. The most common mouth infection is oral candidiasis which is especially common in sucklings. Most common viral causes are herpes and enterovirus. (Jalanko 2014g.)

### 2.3.1 Stomatitis

Stomatitis means the infection of the mucous membranes of the mouth and tongue. This may be caused by a fungus or by a virus. Commonly stomatitis of infants is caused by fungus. (Jalanko 2014h.) *Candida Albicans* or yeast infection is a fairly common infection of the mouth and is fairly common; nearly five per cent of children are infected by fungal stomatitis. *Candida* stomatitis is not a severe problem though it may cause discomfort and redness of the mucous membranes in the mouth. (Jalanko 2014h; 2009, 74.)

Herpes simplex and enterovirus are viruses which also cause stomatitis. Herpes stomatitis causes painful blisters to accumulate into the mouth often causing fever, inflammation of the gums. Inflamed gums may bleed. This is painful for the child and often causes them to stop eating. (Helminen 2013.) Enterovirus, which causes hand-and-mouth-disease, causes blisters to develop in the back of the mouth as well as on the skin (Salo & Siponen 2015). The blisters can be found on the hands and legs of a child as well as on the mucous membranes of the mouth (Jalanko 2014h; Helminen 2013). This differs from herpes-stomatitis by the lack of gingivitis, bleeding from the gums. Otherwise the symptoms are the same as in herpes-stomatitis though they are less severe in cases caused by enterovirus. (Salo & Siponen 2015; Jalanko 2014h; Helminen 2013.) Stomatitis caused by enterovirus is usually cleared within few days (Jalanko 2014h; Helminen 2013).

Infants and small children are usually infected by a mouth contact to a person who is carrying the disease. Most commonly by a kiss from their parents or sharing the same spoon. (Helminen 2013.)

The symptoms of fungal stomatitis in other words yeast infection of the mouth are white spots or coverage on the tongue and other parts of the mouth. These spots may be itching. Yeast is part of the mouth's normal flora and is usually caused by a decrease in the mouths normal bacterial flora. (Jalanko 2014h; Hannuksela

2013.) Fungal stomatitis does not cause other symptoms such as fever. If stomatitis is not treated, it may lead to sores on the tongue and cause discomfort to the child when he's eating. (Salo & Siponen 2015.)

Mild fungal stomatitis may be treated at home by the instructions of a public health nurse. *Candida Albicans* is usually treated at home with acidic foods. Lemon juice and cranberry juice are proven to kill *candida albicans* and remove fungal stomatitis. (Helminen 2013.) If treatment at home with acidic foods does not remove the coverage in the mouth, anti-fungal medication is used for treatment. This needs a prescription which requires the child to be taken to a doctor's examination. (Salo & Siponen 2015.) In any case of severe or largely spread white or light gray coverage on the tongue or other parts of the mouth a child should be taken to be examined by a health care professional (Helminen 2013).

The symptoms of stomatitis caused by the herpes simplex virus are fever, nausea and blisters that develop into the mouth. When the blisters erupt they cause crater like wounds on the mucous membranes of the mouth, most commonly on the gums. These cause pain and infants may stop feeding because sucking causes pain. The sores may also bleed and the gums seem inflamed and red. Small children may also stop eating because of the pain. (Helminen 2013.) The symptoms disappear in few days time by themselves. In some cases the child may need anti-viral medication (acyclovir) to help clear the infection. This works if the medication is started immediately after the symptoms break out. If the child is expressing too much pain to eat or refuses to eat, he should be offered high sugar drinks to provide energy such as ice cream until the infection is cleared. If the child gets excessively tired or weak the child should be taken to a hospital for treatment. (Jalanko 2014h; Helminen 2013.)

## 2.4 Gastroenterology

Gastroenterology focuses on treatment of patients with symptoms or diseases related to abdominal organs. These include diseases of the abdominal area requiring emergency treatment such as acute infections. (Pirkanmaan sairaanhoitopiiri 2015.)

### 2.4.1 Acute abdominal pain

Most of the stomach aches in children are transient and the cause often stays unknown; (Korppi, Kröger & Rantala 2012, 228-229; Rajantie et al. 2010, 436-437) in approximately 40% of the patients with acute abdominal pain the cause stays unknown and the patient recovers without treatment (Mustajoki 2015).

Abdominal pain may be connected to acute gastroenteritis, when usually additional symptoms like diarrhea and vomiting occur. Also other infections, e.g. respiratory infections, otitis, pneumonia, and urinary tract infection might appear as abdominal pain. Constipation can cause intense acute symptoms. In systemic diseases at least diabetic ketoacidosis is a known reason for abdominal pain. (Korppi et al 2012, 228-229.)

Acute and severe abdominal pain in children should be taken seriously and a physician should be contacted with a short leash. Frequent and mild abdominal pain should be monitored and it is considered necessary to investigate the cause by visiting a physician in an outpatient clinic within a week or two. (Mustajoki 2012, 3.) Most of the examinations can be done in primary health care (Jalanko 2003, 119).

Acute abdominal pain can be monitored for few hours at home. If the pain eases and the child is feeling well it is unnecessary to contact a physician. If the pain is intense and continues for over 6 hours it is recommended to apply to an emergency department for physician's assessment regardless of time. (Mustajoki 2015; Jalanko 2003, 119.) If a severe abdominal pain starts suddenly and is unbearable it is necessary to seek treatment immediately (Mustajoki 2015).

Even if the abdominal pain lasts for hours it often is transient but physician's examination and certain laboratory tests are still considered necessary. The cause may stay unknown and child can be taken to a hospital ward for monitoring. (Jalanko 2003, 119.)

It is important to note that patient itself or the parent has to consider the intensity of the pain. Depending on the intensity and the duration of the pain the concerned has to seek treatment. Diarrhea and vomiting related to abdominal cramps indicate of acute inflammation of the bowel. In this case child has to be taken care of at home for couple days. (Mustajoki 2012, 3.) Child may dehydrate due to increased fluid loss which why dehydration has to be assessed and treated properly. Assessment and treatment of dehydration explained more briefly in "Acute gastroenteritis".

#### 2.4.2 Acute gastroenteritis

Inflammation of the bowel, which is known as gastroenteritis is a common disease in children. Approximately 50% of the children have had gastroenteritis before they reach the age of 2. Everyone is vulnerable to gastroenteritis and often families have the same disease. (Jalanko 2003, 79.)

Diarrhea in children is usually caused by viruses (Helsingin ja uudenmaan sairaanhoitopiiri 2015; Korppi et al. 2012, 236; Jalanko 2003, 79). Rotavirus used to be the most common cause for gastroenteritis until it was accepted for the national vaccination program in 2009 (THL 2015; Korppi et al. 2012, 236). Each year over 11 000 children younger than 5 years needed to use health care services; thousands of children were hospitalized and children also had about 9000 health care center visits each year. Rotavirus vaccination has decreased the need of hospital treatment approximately 80% and previously rare diarrhea related deaths are completely avoided. (THL 2015.)

Vomiting and fever are often included in gastroenteritis. The worst complication in diarrhea is dehydration and the treatment focuses primarily for prevention of dehydration and treatment of it. (HUS 2015; Korppi et al. 2012, 236.)



When child is having gastroenteritis, the intake of fluids should be heavily increased. Diluted juices, dairy products, gruels and kisel are recommended. If the child is breastfed it is recommended to offer breastmilk more frequently. Fluids which contain high amounts of sugar and seasoned foods are not recommended because they may aggravate diarrhea. (HUS 2015; Jalanko 2003, 81.) Drinks designed for treating dehydration can be bought from pharmacy. The ratio to administer replacement drink is 50millilitres per each vomit/diarrheal excrement in children aged 0-2 years and 100millilitres in children older than 2 years. (HUS 2015; Korppi et al. 2012, 236-237.)

Feeding should not be stopped instead a child should be offered easily digested, soft and high amount of energy containing food (HUS 2015). Lactic acid bacteria and sour milk products are recommended because it has been proven that they reduce the length of the diarrheal disease (HUS 2015; Etelä-Karjalan sosiaali- ja terveystieteiden tutkimuskeskus 2012; Hove, Norgaard & Mortensen 1998, 347).

If the child is suffering from dehydration, the child has to be taken to a health care professional for assessment and proper treatment. Food is not often given in this situation; instead the child is given drinks designed for treating dehydration. The health status should improve in 4-8hours. Rehydration can be done in an outpatient clinic and even the vomiting patient should be able to tolerate the hydration tube. (HUS 2015; Korppi et al. 2012, 236.)

The development of dehydration is affected by the length of the disease, the amount of excretion, fever and vomiting. A vomiting child dehydrates faster than one with diarrhea only. Weight control is recommended dehydration assessment tool. (Korppi et al. 2012, 236.) Clinical symptoms will not appear in less than 5% weight loss but weight measurement may reveal loss of water. If the child has lost over 5% of one's weight because of dehydration restlessness and irritability may appear, mucous membranes are dry, the child has sunken eyes and skin elasticity has decreased. If the weight loss is more than 10% the peripheral circulation has decreased and peripheral areas are cold gray. 15% weight loss results in shock. (World health organization 2005, 111-112; Huttunen 2002, 158.) If the child's

weight has not been controlled for a while, the weight loss can be determined with growth curve (Korppi et al. 2012, 236).

World health organization, in 2005 has developed a tool to assess dehydration of a child; modified version presented in the table 1. (WHO 2005, 111-112); the table classifies dehydration statuses as no dehydration, some dehydration and severe dehydration. In “No dehydration” there are no symptoms and the treatment is to give fluids and food to replace loss of water. If the child has visited a hospital due to diarrhea a caregiver and the child should be advised to return in 5 days if the health status is not improving. In “Some dehydration” some signs of dehydration have developed and these include restlessness, irritability, sunken eyes, thirst, skin pinch goes back slowly. After rehydration the treatment is the same as in “No dehydration”. Signs in “Severe dehydration” are lethargy, unconsciousness, sunken eyes, unable to drink or drinks poorly and skin pinch goes backs slowly. Severe situation requires hospital treatment. (WHO 2005, 111-112.)

When the child’s dehydration has been repaired feeding should be continued densely in small amounts. Approximately 80% of the energy in food is absorbed even when having diarrhea, so food should be offered even though it might increase excretion. Diarrhea often continues even though dehydration has been corrected. (HUS 2015; Korppi et al. 2012, 236.)

It is necessary to contact the emergency department in hospital and ask for guidance when the child is less than 6 months old, infirm, has bloody diarrhea, dehydration is more than 8%, in a situation when treatment at home or at non-institutional care is not working, when diarrhea has lasted over 3 days, weight is dropping, high fever, a trip abroad is related to symptoms, diarrhea or vomiting is persistent, or when intense abdominal pain is related to diarrhea (Korppi et al. 2012, 237; Jalanko 2003, 81-82).

Table 1. Classification of the severity of dehydration in children with diarrhea (WHO 2005, 111-112).

Classification	Signs or symptoms	Treatment
<b>No dehydration</b>	Not enough signs to classify as some or severe dehydration	<p>→ Give fluid and food to treat diarrhea at home.</p> <p>→ Advise mother on when to return immediately</p> <p>→ Follow up in 5 days if not improving</p>
<b>Some dehydration</b> (Contact a health care professional)	<p><b>Two</b> or more of the following signs:</p> <ul style="list-style-type: none"> <li>• Restlessness, irritability</li> <li>• Sunken eyes</li> <li>• Drinks eagerly, thirsty</li> <li>• Skin pinch goes back slowly</li> </ul>	<p>→ Give fluid and food for some dehydration.</p> <p>→ After rehydration, advise mother on home treatment and when to return immediately</p> <p>→ Follow up in 5 days if not improving</p>
<b>Severe dehydration</b> (Contact a health care professional)	<p><b>Two</b> or more of the following signs:</p> <ul style="list-style-type: none"> <li>• Lethargy/unconsciousness</li> <li>• Sunken eyes</li> <li>• Unable to drink or drinks poorly</li> <li>• Skin pinch goes back very slowly (&gt;2 seconds)</li> </ul>	Hospital treatment.

### 3 AIM OF THE THESIS AND RESEARCH QUESTIONS

Aim of this thesis is to provide useful information for parents in Finland by creating a guidebook; to help them to be familiar with treatment, assessment, and severity of infectious diseases in children aged 0-5 years which can cause confusion and distress among parents as well as to support health care professionals in guiding the parents, especially persons who are unable to understand Finnish language.

Central thesis questions were created and we are trying to answer the questions in the thesis. The main questions considering the thesis are:

1. When one should contact a health care professional if an infant has common cold, influenza, sinusitis, pneumonia, bronchitis, otitis media, conjunctivitis, stomatitis, fungal infection of the groin, acute abdominal pain or acute gastroenteritis?
2. How to treat infectious diseases mentioned in the question 1. at home?
3. How to help a parent to assess child's health status on his own?
4. When a parent should contact a health care professional if the child is having an infectious disease?

## 4 DATA COLLECTION METHODS

This thesis is a functional thesis. Data is collected from variety of different sources; Books, journals, research articles and guidelines.

### 4.1 Developmental approach

A specific definition for developmental approach was not found in the literature but we understand it as discovering a problem and finding a solution for it. Statistics show that every fifth person applies to emergency department even though one does not even need immediate treatment (Nieminen 2014; Kykkänen & Lassheikki 2013); many of the patients are children and due to increasing amount of foreign citizens the patient do not often understand Finnish (Tilastokeskus 2014, 41). We decided to influence the issue and found a method which could work as a part of the solution. Päijät-Häme social and health care group's Acute24 –emergency department did not have a guidebook about infectious diseases in children for parents in English. We also think that our view is part of the developmental approach; Infectious diseases in children are an interesting topic to learn about and later we are able to utilize it in our careers. The process was begun by using descriptive literature review as a method in order to find theoretical information for the thesis and guidebook. Descriptive literature review has 4 stages; forming the thesis questions, selecting data, constructing description and inspecting results (Kangasniemi et al. 2013).

### 4.2 Functional thesis

In functional thesis an action or organization is researched and developed. The purpose is to solve different practical problems. Functional thesis includes both process and product development which mean creating new and improving the current situation, product and/or knowledge. (Helakorpi 1999, 57-58.) In our thesis this means we found it to be a problem that many of the children applying to emergency departments are not in need of emergency care, and we try to solve and ease the problem by researching the material which could improve one's

knowledge and decision-making, and by creating a guidebook for parents so they would understand when it is necessary to seek treatment.

#### 4.3 Data collection methods

The thesis is a functional thesis. Qualitative research method is used to collect data about the subject. Data is collected from the internet, books, and researches. Internet is wide which why we have narrowed our searches to databases provided for Lahti university of applied sciences in nelliportaali and Masto-Finna. We also found information from different websites, for example Duodecim, Käypä hoito, and national institute for health and welfare which are well researched, up-to-date and written by experienced health care professionals. Terveyskirjasto was used several times as a source because it provides reliable, independent, and updated information about health and diseases in Finland. Articles in Terveyskirjasto are based on national guidelines for treatment and physicians handbooks produced by Kustannus Oy Duodecim. As keywords in the data collection we used infant, infection, guide, infectious diseases, children, family, parents, and different infectious disease names; otitis media as an example. Finnish keywords were also used: lapsi, imeväinen, infektio, ohjeistus, infektioaudit, perhe, vanhemmat.

Public and school libraries provide different and a wide range of books about pediatric diseases and treatments, which why we had to narrow down the amount by searching information about specific issues, choosing the latest edition available, and picking the books which had been written by an experienced pediatric health care professional. We try to compare similarities in data from different sources by choosing few different sources for comparison; we choose the one which is more up-to-date unless the data provided by the book is similar to older one.

Nelliportaali and Masto-Finna offer different data sources for finding researches related to thesis. The guidebook based on the data in the thesis is created for use in Finland which why we try focusing on finding Finnish researches. Through Nelliportaali and Masto-Finna we were able to access Medic service which provides thousands of Finnish references about medical and nursing sciences;

books, articles, doctoral theses and research institute reports are all included. We had to narrow down the search by choosing the latest publication available and using peer-reviewed articles.

## 5 GUIDEBOOK ABOUT THE INFECTIOUS DISEASES IN CHILDREN FOR PARENTS

### 5.1 Development of the guidebook

A guidebook has to be written in easily understandable language and the content needs to be comprehensive. By understandable is meant that the words used need to be understandable by the target group and keep the content simple. The content has to be written in correct order; often prioritizing is the best way. The most significant thing is explained at first and the least significant last. The significance has to be determined by the writers own thoughts. (Hyvärinen 2005.)

People tend to follow the rules when advices are explained, and the best way is to explain the benefits for the patient if one follows the given guidance. The guidebook does not have a recommendation for minimum or maximum length; the length is determined by who is it made for. (Hyvärinen 2005.)

When writing a guidebook the publication part has to be taken into consideration. Depending if the guidebook is published in the internet or as a booklet the text should be modified to fit the purpose, especially the text in internet has to be short because it is considered more difficult to read from the computer screen. Pleasant appearance of the guidebook, proper alignment of the text and pictures increase the readability. The content alone does not make the guidebook good, presentation has to be in order also. (Hyvärinen 2005.)

### 5.2 Feedback

We decided to collect feedback from our health care professional colleagues and non-professional acquaintances and gave the guidebook for evaluation. The feedback was collected as an open feedback in written form. To increase the amount of participants and to appreciate their privacy it was promised to keep the feedback anonymous and written feedback to be destroyed when the summary had been done.



Feedback was collected from 9 different persons whom 4 were health care professionals. All the feedback was emphasized on the appearance, practicality, content, and utility. According to feedback the guidebook was clear, understandable, educational, usable, and content was well summarized and had enough information. All of the participants gave positive feedback on the phone numbers presented on each page. One health care facility wanted the guidebook to be used in their emergency clinic. The only constructive feedback was to clarify where the cover picture was taken from and if it was licenced.

The licence for the picture was pending because we had contacted the site where we took the picture from but it resulted in negative answer after we had released the final version for evaluation. Now the picture has been removed from the guidebook.

We also received positive feedback from Päijät-Häme central hospital Acute24 – emergency department; Versatile and up-to-date data, each section was written separately, phone numbers can be seen on each page, and most common infectious diseases in children are included in the guidebook. As neutral feedback there were small differences between our guidebooks information and the current methods in Päijät-Häme social and health care group. Päijät-Häme social and health care group has promised to do the changes after the pediatrics in the hospital have read the guidebook and evaluated it. The guidebook was accepted and after they make the changes they will take it into practical use.

### 5.3 Target group and utilization of the guidebook

The guidebook is made for Päijät-Häme social and health group's Acute24 – emergency department. The target group is all the parents, especially the ones who do not understand Finnish and prefer English instead. Acute24 –unit has shown their interest in translating the guidebook to other languages also. The purpose is to share knowledge of infectious diseases in children, support decision-making skills and to help with home treatment. Health care personnel in Acute24 –unit benefit of our work. It will support their guidance skills and knowledge when dispatching patients home.

The purpose of the guidebook is to improve the decision-making skills of parents to reduce unnecessary visits to hospital or reduce anxiety caused by the situation by increasing the knowledge to gain good awareness and self-confidence in the situation. The guidebook also explains home treatment for common infectious diseases in children. Health care personnel can use it to support their knowledge when giving guidance to parents.

The guidebook based on the thesis is produced for Päijät-Häme social and health care group's Acute 24 –unit with full rights. The thesis is shared in public in Theseus so everyone can access it. Päijät-Häme central hospital has the right to share the guidebook to other organizations and we recommend it.

## 6 DISCUSSION

According to Finnish advisory board on research integrity called Tutkimuseettinen neuvottelukunta which sets the ethical guidelines on studies carried out in Finland scientific research has to follow the acknowledged policies. Advisory board demands that an ethical research has to be composed honestly, accurately and carefully. (Tutkimuseettinen neuvottelukunta 2012.) These ethics were applied into the data collection and development of the guidebook.

The thesis was carefully and accurately planned and composed by actively discussing and spending enough time on data collection and planning. Sources were chosen together and the reliability of the sources evaluated. Carefulness was one of our main points in data collection because as future nurses our nursing practices are based on evidence based practice, the thesis is created for non-professional use and most of all the thesis helps us to learn about the subject. The main idea was to create a guidebook for parents and health care professionals which included researched information about infectious diseases in children which why we considered it to be important to explain the reliability of the material and our ethical point of view.

Helakorpi (1999, 71-72) has explained that qualitative research method has no unambiguous way to evaluate the reliability of the research unless triangulation and/or different analysis methods are used, and the content equates reality. Triangulation means the use of multiple sources or material.

Multiple different sources are used in our thesis and at least 2 references with the similar content have been used in most of the theoretical parts to support the reliability of the thesis. References used were peer-reviewed, limited to the 21<sup>st</sup> century, professional books, and professional articles which were published in trusted websites.

We recommend that the next versions of the guidebook have more infectious diseases added. We would like that our ethical point of view is respected and the following versions are composed carefully, honestly and accurately, and the information will be kept up-to-date and reliable. The guidebook had raised interest

in other health care facilities and we hope that the guidebook will spread in Finland and it is frequently offered to new parents. A developmental suggestion for the future is to create an online version of the guidebook with multiple different languages. Hopefully our creation can be found from different hospitals or from trusted websites later on.

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**Infectious diseases  
in children and  
treatment at home**

**Guidebook for parents**

**Akseli Nurmio & Henry Noterman**

**4.1.2016**

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## COMMON INFECTIOUS DISEASES IN CHILDREN

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#### Contact numbers

Acute24 –emergency department  
03 819 2385

In emergency situation  
Call 112

Poison Information Centre  
09 471 977

## **INTRODUCTION**

### **What are infectious diseases in children?**

Infectious diseases are diseases caused by pathogens, micro-organisms that infiltrate the body causing different type of diseases, according to the pathogen. Pathogen is a micro-organism that causes diseases. These pathogens might be bacteria, fungi or viruses. An infectious disease always causes an inflammatory response in the body. The infecting micro-organism causes the immune system to respond. It may show as local inflammation in the mucous membranes, e.g. in the bronchus (bronchitis) or as a change in the number of white blood cells in the bloodstream. White blood cells, leukocytes increase in number when the body detects a foreign particle or organism and an inflammatory response is the human body's normal way of combating invading micro-organisms, by increasing the number of white blood cells in the bloodstream.

Infections are the leading diseases in children, and especially common in infancy. All children get infectious diseases and statistically they are the most overwhelming reason for sick leaves in school and day care. The most common infection is viral upper respiratory infection, which a small child has multiple times in a year. As a consequential disease child may end up having several ear infections in a row, causing sleepless nights and several antibiotic treatments.

### **What is this guidebook and why it was made?**

This guidebook introduces common infectious diseases in children aged 0 to 5 years. The idea is to support parents to understand possible infections and treatment at home, and when to seek care. Guidebook was written in English to provide information for the international clients in hospital environment. The information presented in the guidebook is based on research articles, books and trusted websites; as an example Terveyskirjasto and Käypä hoito, which include latest and researched knowledge.

### **Liability restriction**

The information provided by the guidebook is gathered from reliable data sources. The information will not replace doctors or another health care professional's own evaluation of a specific patient's best diagnostic method and treatment.

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## **Common cold**

Infection of the upper airways consisting of the nasal cavities and the pharynx. Common cold is not caused by exposure to cold; instead it is caused by a variety of viruses.

### **Symptoms**

- Blocked or runny nose
- Throat pain, especially when swallowing or coughing
- Cough
- Fever
- Joint pain

Usually the cold lasts for 7 to 12 days where most of the symptoms have cured. A cough may continue up to 3 weeks. Coughing and blocked nose may cause the child to wake up at night because of the mucous running into the trachea from the nasal cavities.

### **Treatment**

There is no medical cure for the common cold and each symptom is treated separately. Almost all of the colds get cured without pharmaceutical care. Medication can still be used to alleviate the symptoms.

A couple drops of saline may be administered into the child's nasal cavities and gentle suction may be used with a specific tool available from pharmacies to remove mucous from the nasal cavities which alleviate the discomfort of a blocked nose. Child's bed headboard can be lifted higher to ease discomfort when sleeping.

### **When to contact a health care professional?**

- Child seems painful and wakes up frequently at night
- Fever that lasts over 5 days
- High fever and child seems more tired than normally
- The fever decreases and rises again
- Eyes start to secrete more than normally.
- Breathing is highly frequent, puffy or begins to sound wheezy.
- The cold lasts for over 2 weeks

The main point is to monitor the child's overall condition and if the child seems to be excessively tired and unwell a health care professional should be contacted.

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## **Influenza**

Influenza is an infection of the upper airways; the virus attacks the cells of the nasal cavities and the pharynx. Influenza is caused by three different kinds of orthomyxoviruses; A, B and C. A and B are responsible for the annual influenza epidemics. Influenza is spread by the respiratory secretions such as mucous and sputum which are released when an infected person coughs or sneezes.

### **Symptoms**

- Blocked nose
- Throat pain, especially when swallowing or coughing
- Cough
- High fever
- Muscle aches
- Joint pain

Symptoms are cold like and appear in 1-2 days after getting an infection. Symptoms are more severe than in common cold.

### **Treatment**

Influenza may be eased with antiviral medication which alleviates the symptoms of influenza and reduces its infectivity. Antiviral medications lower the risk of complications. Vaccination does not give complete immunity because of the rapid mutations of viruses but it has been proven to substantially decrease infectivity and the risk of getting influenza.

In most cases influenza is cured by itself in a week with rest and symptom alleviating care.

### **When to contact a health care professional?**

- Child is under 35 months old
- Child seems painful and wakes up frequently at night
- Fever that lasts over 5 days
- High fever and child seems more tired than normally
- Breathing is highly frequent, puffy or begins to sound wheezy.
- The cold lasts for over 2 weeks

#### **Contact numbers**

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## **Sinusitis**

An infection of the sinus, a cavity which links the otitis media to the nasal cavities. Sinusitis is caused by bacteria and in rare cases fungi being trapped into the sinus. The microbes trapped in the sinus cause pressure to build up causing discomfort to the child.

### **Symptoms**

- Pus-like secretion from the nasal cavities
- Pain in the cheeks and face, especially when leaning forward
- Distorted sense of smell
- Headache

Sinusitis is often associated with other upper airway infections such as the common cold and influenza, which why acute sinusitis is hard to differentiate from the common cold. Also in children less than 6 years old the sinuses seem blocked in radiological findings even though there would not be a case of sinusitis. Symptoms that last up to 10days or severe symptoms that last from three to four days are an indication that the child might have sinusitis.

### **Treatment**

Treatment of symptoms in sinusitis is enough in most cases when they are associated with flu like symptoms. Pain medication, decongestant nasal sprays and antihistamines reduce the symptoms of upper airway infections. A health care professional should be consulted if you are unsure of the medication and doses.

Treatment of acute sinusitis is commonly started with nasal dilating sprays which reduce the pressure in the sinus and eases the outflow of the secretions. For the antibiotic treatment to be started there must be a clinical finding of the type of bacteria infecting the sinus. If antibiotic treatment does not work a mechanical removal of secretion in the sinus may be used with the antibiotics.

### **When to contact a health care professional?**

- If a new medication is used for the first time, consult a health care professional or pharmacist.
- Child becomes feverish
- Child has ache on the forehead or between the eyes
- In flu-like symptoms see instructions for common cold and influenza

If the symptoms disappear it is not necessary to seek treatment.

#### **Contact numbers**

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## **Pneumonia**

Pneumonia is an infection of the lungs caused by fungi, viruses or bacteria. The infection causes fluid and inflammatory waste to accumulate into the lungs, covering alveoli and inhibiting gas change in the lungs causing breathing problems. Usually a complication of previous upper airway infection, such as influenza.

## **Symptoms**

- Tiredness
- Fever
- Coughing
- Heightened breathing ratio with chest indrawing
- Chest pain while coughing
- Bloody sputum

## **Treatment**

Children in Finland are vaccinated against pneumococcus since 2010, but it does not protect against viruses. Even though bacterial infections are now rare in children antibiotics are still used to treat pneumonia because the cause is hard to determine without invasive sample. Prognosis with antibiotic treatment is the same regardless the pathogen causing pneumonia.

If the symptoms are not severe and the child is not in critical condition pneumonia can be treated at home with antibiotics and rest with a good prognosis. In severe cases the child is hospitalized to receive intravenous antibiotic treatment. Vaccinations are a key factor in preventing pneumonia.

## **When to contact a health care professional?**

- If a parent suspects that the child is more tired than usual
- Child has high fever
- Child's fever and cough get worse and the child gets exceedingly tired
- Child with fever has high breathing ratio
- Child's cough lasts for over 2 weeks
- Each time the child has blood in sputum

### **Contact numbers**

Acute24 –emergency department  
**03 819 2385**

In emergency situation  
**Call 112**

Poison Information Centre  
**09 471 977**

## **Bronchitis**

Bronchitis is the infection of the bronchi, the airways leading from the trachea to the lungs. The infection causes the bronchi to swell. This causes airflow to be partially obstructed by the mucous on the surface of the bronchi.

## **Symptoms**

- High fever
- Extensive and dry coughing
- Noisy/Wheezing breathing

Bronchitis is usually associated with a prolonged cold or flu which why symptoms may be similar with the common cold.

## **Treatment**

Depending on the severity of the bronchitis, the child is either hospitalized or the disease can be managed at home. If the bronchitis is caused by bacteria may an antibiotic treatment be required. In most cases severe bronchitis is caused by a virus in which treatment of the symptoms is the key to recovery. If child has no breathing difficulties and is feeling well treatment is not required because viral bronchitis should heal spontaneously within 1-2weeks.

Hydration of the child is important. It eases coughing up the mucous.

## **When to contact a health care professional?**

- Child less than 6months old has progressive cough, dry rattling sound heard during breathing(rhonchus), breathing difficulties and tiredness
- Infant has severe fit of coughs or cessation of breathing (apnea).
- If you suspect that a coughing child has swallowed a toy or foreign object
- Child develops hoarse and dull cough, rhonchus while inhaling and breathing difficulty
- Child with flu has dense and arduous breathing and whining breathing.
- Coughing child has fever and increasing amount of mucous excretion which last over a week
- Child's cough has lasted several weeks.

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## Otitis media

Otitis media means the infection of the middle ear and is one of the most common infections in infants and young children. The infection is mainly caused by bacteria trapped in middle ear due to inflammation in the nasal cavities and the pharynx. This is caused by an upper airway infection such as the common cold or influenza.

## Symptoms

- Pain in the ear
- Pus-like secretion in the ear
- Restlessness at night time
- Ear groping with infants may indicate pain or discomfort in ear
- Lessened sensation of hearing in older children

Symptoms of acute otitis are mainly the same as with the common cold and influenza. The absence of ear pain does not rule out a case of otitis media if the other symptoms match.

## Treatment

Majority of children are cured spontaneously. Sometimes a diagnose of the otitis media is unclear which why a doctor prescribes pain- and anti-inflammatory medication and ear drops to alleviate the pain and discomfort. A control visit is often required to make diagnosis more reliable. This is to minimize the use of antibiotics.

It is recommended to visit a health care professional after a month of diagnosis and treatment. The checkup is to minimize the risk of possible complications and to discover possible complications before they start to cause harm to the child.

Untreated otitis media may lead to permanent hearing damage, damage to middle ear or may lead to other severe infections.

Relieving pain is the primary treatment at home. Amounts presented in table.

<b>Paracetamol</b>	15mg/kg/dose	60mg/kg/24hours
<b>Ibuprofen</b>	10mg/kg/dose	40mg/kg/24hours

## When to contact a health care professional?

- Child with common cold seems painful or is restless at night
- Small child's common cold lasts over 2 weeks.
- Child tells that he/she has pain in the ear
- Ear starts to secrete pus.
- A child with ventilation tubes inserted by a surgical procedure gets painful, ear starts to secrete pus or secretion does not stop even though antibiotics have been used for several days.
- If lessened hearing is suspected.
- If pain management at home is not helping

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## **Conjunctivitis**

Conjunctivitis which is also known as pink-eye is the infection of a translucent membrane that covers the underside of the eyelid and the surface of the eye. Conjunctivitis is caused by the same strands of bacteria and viruses which cause common cold and influenza. Conjunctivitis may also be a symptom of allergies.

## **Symptoms**

- Redness of the eye
- Burning sensation in the eye
- Pus-like secretion in the corners of the eye

All the irritations of the eye are not related to infections. External mechanical factors, e.g. dust may cause symptoms in the eye.

## **Treatment**

Viral conjunctivitis goes by itself in a few days and does not need treatment. Pus-like secretion from the eye is an indication of a bacterial infection which may require antibiotic treatment and so to be seen by a doctor.

If eye secretes it is recommended to wash the face with water at least 10 times a day and lema should be cleansed with wet cotton in the mornings and before administering eyedrops.

## **When to contact a health care professional?**

- Eye secretes
- If the infection does not start to heal
- Eye becomes inflamed
- Eye feels painful
- Sight problems occur

### **Contact numbers**

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**03 819 2385**

In emergency situation  
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## **Stomatitis**

Infection of the mucous membranes of the mouth and tongue. Caused by fungi or viruses. Infection usually spreads by a mouth contact to a person who is carrying the disease. Most commonly by a kiss or sharing the same spoon.

## **Symptoms**

- Redness of the mucous membranes in the mouth
- Discomfort
- Painful blisters in mouth
- Fever
- Gums seem inflamed and red
- Blisters on skin and in the back of the mouth
- White spots or coverage on the tongue and other parts of the mouth which can be itchy
- Nausea

Symptoms vary depending on the cause. Pain often causes child to stop eating.

## **Treatment**

Treatment varies depending on the cause. Stomatitis caused by enterovirus and the symptoms in herpes simplex infection are usually cleared within few days. Acidic foods, for example lemon juice and cranberry juice kill candida albicans which often is the cause of fungal stomatitis.

If treatment at home does not remove the coverage in the mouth an anti-fungal or anti-viral medication is required, depending on the cause. In this case a child needs to be taken to a doctor for examination.

If the child is painful to eat or refuses to eat the child should be offered high sugar drinks and food to provide energy such as ice cream until the infection is cleared.

Untreated stomatitis may lead to sores on the tongue and cause discomfort when eating.

## **When to contact a health care professional?**

- Child gets excessively tired or weak
- If home treatment does not work
- Severe or largely spread white or light gray coverage on the tongue or in any parts of mouth

It is recommended to consult a public health nurse if stomatitis is suspected for instructions.

### **Contact numbers**

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03 819 2385

In emergency situation  
Call 112

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09 471 977

## **Acute abdominal pain**

Most of the stomach aches are transient and the cause often stays unknown. Abdominal pain may be connected to other infectious diseases for example gastroenteritis, respiratory infections and urinary tract infection. Constipation can cause intense acute symptoms.

### **Symptoms**

- Mild to severe abdominal pain
- Abdominal cramps

Additional symptoms may indicate of a disease that's causing the abdominal pain, e.g. gastroenteritis often includes vomiting and diarrhea.

### **Treatment**

In approximately 40% of the patients with acute abdominal pain the cause stays unknown and the patient recovers without treatment.

Acute abdominal pain can be monitored for few hours at home. If the pain eases and the child is feeling well it is unnecessary to contact a health care professional. It is important for the parent or patient itself to consider the intensity of the pain.

Even if abdominal pain lasts for hours it often is transient but physician's examination and certain laboratory tests are still considered necessary. The cause may stay unknown and the child can be taken to a hospital ward for monitoring.

### **When to contact a health care professional?**

- If the abdominal pain starts suddenly and is unbearable it is necessary to seek treatment immediately.
- If abdominal pain is mild and frequent it should be monitored and a physician should be visited in an outpatient clinic within a week or two.
- If the pain is intense and continues for over 6 hours.
- Depending on the intensity and the duration of the pain the concerned has to seek treatment.

#### **Contact numbers**

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## Acute gastroenteritis

An inflammation of the bowel is a common disease in children. Usually caused by viruses, especially rotavirus used to be the most common cause before a vaccine was accepted for the national vaccination program in 2009.

### Symptoms

- Vomiting
- Fever
- Dehydration

Dehydration is the worst complication in gastroenteritis.

### Assessment of dehydration

Weight control is a recommended dehydration assessment tool. Clinical symptoms will not appear in less than 5% weight loss but weight measurement may reveal loss of water. If the child has lost over 5% of the weight restlessness and irritability appear, mucous membranes are dry, the child has sunken eyes and skin elasticity has decreased.

If the weight loss is more than 10% the peripheral circulation has decreased and peripheral areas (Hands, feet) are cold gray. 15% weight loss results in shock.

Classification	Signs or symptoms	Treatment
<b>No dehydration</b>	Not enough signs to classify as some or severe dehydration	→ Give fluid and food to treat diarrhea at home. → Advise mother on when to return immediately → Follow up in 5 days if not improving
<b>Some dehydration</b> (Contact a health care professional)	<b>Two</b> or more of the following signs: <ul style="list-style-type: none"> <li>▪ Restlessness, irritability</li> <li>▪ Sunken eyes</li> <li>▪ Drinks eagerly, thirsty</li> <li>▪ Skin pinch goes back slowly</li> </ul>	→ Give fluid and food for some dehydration. → After rehydration, advise mother on home treatment and when to return immediately → Follow up in 5 days if not improving
<b>Severe dehydration</b> (Contact a health care professional)	<b>Two</b> or more of the following signs: <ul style="list-style-type: none"> <li>▪ Lethargy/unconsciousness</li> <li>▪ Sunken eyes</li> <li>▪ Unable to drink or drinks poorly</li> <li>▪ Skin pinch goes back very slowly (&gt;2 seconds)</li> </ul>	Hospital treatment.

Classification of the severity of dehydration in children with diarrhea (WHO 2005, 111-112).

## Treatment

Treatment focuses primarily for prevention of dehydration and treatment of it.

The intake of fluids should be heavily increased; Diluted juices, dairy products, gruels and kisel are recommended. If the child is breastfed it is recommended to offer breastmilk more frequently. Fluids which contain high amounts of sugar and seasoned foods should be avoided because they may aggravate diarrhea.

Replacement drinks designed for treating dehydration can be bought from pharmacy, for example Floridral and Osmosal. The ratio to administer replacement drinks is shown on the table:

Children aged 0-2 years	Children older than 2 years
50ml per vomit/diarrhea	100ml per vomit / diarrhea

Feeding should not be stopped, instead a child should be offered easily digested, soft and high amount of energy containing food. Lactic acid bacteria and sour milk products are recommended because they reduce the length of the diarrheal disease.

When the child's dehydration has been repaired feeding should be continued densely in small amounts. Approximately 80% of the energy in food is absorbed even when having diarrhea so food should be offered even though it might increase excretion. Diarrhea often continues even though dehydration has been corrected.

### When to contact a health care professional?

- Child is less than 6 months old
- Infirm
- Bloody diarrhea
- Treatment at home is not working and dehydration is more than 8%.
- Diarrhea has lasted over 3 days
- Weight is dropping
- High fever
- A trip abroad may be related to symptoms
- Diarrhea or vomiting is persistent
- Intense abdominal pain related to diarrhea

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