



Administration of inhaled asthma medication for children aged 1-3 years old: an educational video for nursing students

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The purpose of this thesis was to create an educational video in English that demonstrates the proper administration of inhaled asthma medication for nursing students. The absence of English educational videos reflecting the Finnish approach highlighted the need for this thesis. The aim of this thesis was to increase the skill of nursing students regarding inhaled asthma medication, the required equipment, and the administration of asthma medications for children aged 1-3 years

Using a co-design/functional thesis approach, an educational video was created and evaluated by six final-year nursing students. The feedback was gathered anonymously using a questionnaire which was created by Google Forms. Feedback indicated a positive response, emphasizing the video's clarity and simplicity, with a survey featuring five close-ended questions. The video adheres to current recommendations and guidelines, aligning with evidence-based practices. The authors expressed satisfaction with the desired outcome, deeming the educational video suitable for nursing education.

Keywords: asthma, children, inhalation, educational video

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1 Introduction

Asthma, which affects approximately 5% of Finnish children, is the most common long-term disease in children and is characterized by prolonged coughing, difficulty in breathing, and symptoms related to physical exertion (Terveyskylä 2021). The probability of children developing asthma and allergies rises if a family member suffers from either condition (Thomsen 2015). Childhood asthma is rising due to factors such as allergen exposure, air pollution, secondhand smoke, limited exposure to illnesses that boost the immune system, and lower breastfeeding rates (Dharmage, Perret & Custovic 2019). The main treatment for asthma, which involves inhaling drugs such as cortisone-based medications, is supplemented in children with bronchodilator medication to open their branchial tubes (Allergia- iho-, ja astmaliito 2023).

Managing asthma in children aged 1-3 years old presents unique challenges. Young children may not have the verbal skills to effectively express their symptoms and concerns. Unlike older children or adults, children may have trouble communicating when they have shortness of breath, chest tightness, or other asthma related symptoms. Lack of communication can lead to difficulties in communication between the child and parent or with health care professionals to assess the severity of a child's condition and provide appropriate care. (Rehman, Morais-Almeida & Wu 2022.)

Several studies and research articles have advanced our comprehension of asthma management in the age group of 1-3 years old, exploring triggers of exacerbations like respiratory infections, allergens, and environmental factors. Additionally, researchers have evaluated the safety and effectiveness of specialized inhaled medications and dosing devices. (Martin, Townshend & Brodlie 2022.) Despite existing knowledge and research, there is still a gap in the availability of comprehensive and specific English-language educational video particularly from the Finnish perspective, that specifically focuses on asthma medication administration for children aged 1-3 years old.

The purpose of the thesis is to create an educational video in English that demonstrates the proper administration of inhaled asthma medication for children aged 1-3 years old for nursing students. Educational video plays an important role in providing practical guidance for nursing degree students, health care professionals, parents, and others in the care of young children aged 1-3 years old with inhaled asthma medication. Developing an educational video will increase the availability of valuable information and supporting skills for promoting effective asthma control techniques among children aged 1-3 (Brame 2016).

2 Asthma

2.1 Definition of Asthma

Asthma is a chronic respiratory condition characterized by symptoms like wheezing, coughing, chest tightness, and shortness of breath (WHO 2023). These symptoms worsen during asthma attacks when the airways narrow and produce excess mucus (Salomaa 2022). Asthma can be caused by a combination of genetic and environmental factors. The probability of children developing asthma and allergies rises if a family member suffers from either condition. (WHO 2023.)

Exposure to allergens such as dust mites, pet dander, mold, and certain foods can also cause asthma symptoms in susceptible children. Respiratory tract infections, especially viral infections such as the flu or respiratory syncytial virus (RSV), can increase the likelihood of developing asthma. Environmental factors such as cigarette smoke, air pollution and exposure to chemicals or irritants can cause the development and aggravation of childhood asthma symptoms. In addition, early-stage factors such as preterm birth, low birth weight, exposure to secondhand smoke during pregnancy, in early childhood exposure to allergens or respiratory irritants may also increase the risk of asthma. (Custovic, Moira, Murray & Simpson 2023.)

Asthma can be managed through medical treatments like bronchodilators and anti-inflammatory medication, as well as lifestyle changes such as avoiding triggers (Salomaa 2022). Children's asthma can improve. During playtime, up to 20% of kids have experienced recurrent respiratory issues. More than half of them have a moderate, or retreating, type of condition, which typically improves permanently. Actual chronic asthma affects 5-10% of children. By adulthood, a few of them as well recover. (Mehiläinen 2020.)

2.2 Respiratory tract anatomy

Respiration is the vital process of exchanging respiratory gases, oxygen, and carbon dioxide, between the body, and the environment. The respiratory tract's purpose is to maintain oxygen supply and eliminate metabolic carbon dioxide. The respiratory system, including the airways and lungs, plays an important role in the process. The upper respiratory tract consists of the nasal and oral cavity, pharynx, and larynx, while the lower respiratory tract includes the trachea, bronchi, and lungs. (Leppäluoto, Rintamäki, Vakkuri, Vierimaa & Lauri 2019, 162-183.)

The lungs consist of alveoli that facilitate gas exchange. Respiratory muscles, such as the diaphragm and intercostal muscles, are involved in inhalation and exhalation. Auxiliary respiratory muscles in the neck, chest and abdomen also help with breathing. (Leppäluoto et al., 2019, 162-183.) Lungs are the only internal organs in direct contact with inhaled air. Lungs are susceptible to various health problems due to structure, function, and protective inflammatory cells (Terveyskylä 2022). Nursing students should familiarize themselves with respiratory structures, and their functions. Anatomy of respiratory structure and their function is essential for delivering comprehensive care, and support to individuals with respiratory conditions. (RCH 2023.)

2.3 Anatomical and physiological special features of the child's respiratory system

The respiratory system of a developing child undergoes changes in its anatomy and physiology. The placement of the ribs and the shape of the thorax help with breathing in older kids and adults. Infants require their abdominal muscles to help them breathe because of the infant's very compliant chest wall, which is caused by the infant's horizontal rib position, round thorax, thin chest wall, and lack of muscle support. Furthermore, an infant's diaphragm is flatter than an older child's, which reduces the effectiveness of each contraction. (Peate 2015, 620, 625.)

The lungs are still developing throughout childhood. From birth until the age of eight, lungs continue to develop before being deemed anatomically mature. Children's oxygen consumption rates are higher, their resting lung capacities are smaller, and they have fewer oxygen reserves, all of which contribute to rapid deterioration when respiratory function is impaired. (Peate 2015, 595, 611-612.)

Due to the limited respiratory capacity and rapid metabolism of children, swift harm can occur in the presence of an oxygenation imbalance. As a result of the child's small airways and swelling, breathing problems can quickly get worse. (Kuisma, Holmström, Nurmi, Porthan & Taskinen 2017, 360-361.) Up until the child is roughly eight years old, there are an estimated 500 million alveoli in their lungs. This significantly increases the surface area of the lungs despite their relatively small total size within the body. The development of alveoli is thought to be most rapid between the ages of three and four, with severe respiratory infections during this period being associated with adult respiratory disease. (Peate 2015, 610.) Compared to adults, infants have increased airway resistance and oxygen consumption. The infant's diaphragm has a limited number of slow muscle fibers, which are necessary for prolonged, difficult breathing work. (Suominen 2017.)

3 Children's asthma

Asthma occurs in 6-10% of children and is the most prevalent chronic disease during childhood in Western countries (Jalanko 2021). In Finland, Finlex (2019) states that anyone under the age of 18 are regarded as children. Children aged 1-3 are classified as toddlers. Asthma in children usually starts at play or school age and some toddlers experience their first signs of asthma between the ages of one and two years old in the form of breathing problems or persistent coughs brought on by illnesses. In adolescence, asthma often gets better, but for some people, the tendency persists for the rest of their life in asthma. (Duodecim 2021.)

Asthma can be caused by a combination of genetic and environmental factors. The probability of children developing asthma and allergies rises if a family member suffers from either condition. (WHO 2023.) Exposure to allergens such as dust mites, pet dander, mold and certain foods can also cause asthma symptoms in susceptible children. Respiratory tract infections, especially viral infections such as the flu or respiratory syncytial virus (RSV), can increase the likelihood of developing asthma. Environmental factors such as cigarette smoke, air pollution, and exposure to chemicals or irritants can cause the development and aggravation of childhood asthma symptoms. In addition, early-stage factors such as preterm birth, low birth weight, exposure to secondhand smoke during pregnancy, and exposure to allergens or respiratory irritants in early childhood may also increase the risk of asthma. (Custovic, Moira, Murray & Simpson 2023.)

Children between the ages of 1-3 years old have limited language and communication skills. Lack of communication brings challenges for parents and healthcare providers to accurately identify and assess asthma symptoms in children aged one to three. (Rehman, Morais-Almeida & Wu 2022.) Inhalable medicines for children under five years of age should be given as an aerosol and using space extension. Asthma medicine masks are used by children up to the age of three. (Terveyskylä 2021.) The lungs of children aged 1-3 years are still developing. Young children have a reduced lung capacity (Kviklyte 2021).

3.1 Symptoms of asthma

Asthma in children can manifest as difficulty exhaling, wheezing, reduced stress tolerance, mucus, hoarseness, and prolonged cough, with varying duration and frequency, often accompanied by swelling of the mucous membrane due to mucus secretion and inflammation. Usually, this is more common in smaller children, who are also prone to frequent colds, which can lead to prolonged coughing. Diagnosing asthma is essential to determine whether the

cough persists for over eight weeks and occurs at night or during exertion. (Mäkelä et al., 2020, 371.)

An asthma attack occurs when a child's breathing becomes difficult due to worsening asthma symptoms. The severity of asthma attacks can vary from mild to very serious to extremely life-threatening. (Parkland 2023.) While a typical asthma attack is characterized by coughing, difficulty breathing, and wheezing on exhalation, not all children with asthma exhibit these symptoms. Some may experience constant mucus and a runny nose, low tolerance to physical stress and night waking due to coughing and shortness of breath. Coughing and anxiety after exertion can last for up to an hour. (Duodecim 2021.)

Maintaining good control of a children's asthma is a key component to prevent serious attacks. Asthma should not disrupt a child's daily routine. (Parkland 2023.) Asthma symptoms in children, varying with age, often involve wheezing during viral illnesses, under three years old. There can also be intermittent periods of wellness between infections. This type of asthma typically improves over time. Severe or frequent episodes at night might lead to diagnosis and regular preventive medication (Mehiläinen 2023).

3.2 Diagnosis of asthma

Diagnosing asthma in children is complex, as coughing and wheezing are common symptoms during colds and chest infections, and these do not necessarily indicate asthma (Ali, Nabih & Eltohami 2018). Diagnosis of asthma should rely on symptoms, airflow limitation variability, and treatment response. Lung function tests such as PEF and spirometry serve as aids for diagnosis in children over five years old. Also monitoring progress and adjusting treatment, while diagnosis for children under five remains challenging as lung function testing is impractical outside of a research setting. (Martin, Townshend & Brodlie 2022.) Pediatricians can perform blood or skin tests to assess for inflammatory markers and allergies that could trigger asthma symptoms and perform chest X-rays to rule out conditions and examine the airways for changes caused by severe asthma (Lockett 2020).

Diagnosing and treating asthma in small children can be challenging as frequent symptoms do not necessarily confirm the condition, and not all symptoms indicate permanent asthma (Mäkelä, Harvima, Kauppi 2020, 371). Although hereditary factors are often linked with asthma, an external stimulus is typically required for the disease to develop at any age. Various factors can irritate inflamed bronchial tubes. The most common factors are infections, allergies, such as pollen, pets, and foods, as well as physical and chemical irritants like tobacco smoke and air pollution. (Terveyskylä 2020.)

3.3 Treatment of asthma

Treatment for asthma seeks to alleviate or eliminate the symptoms while preventing further airway inflammation because the condition cannot be cured (Lockett 2020). The treatment of asthma in children depends on the child's age, the severity and the frequency of asthma attacks, and their ability to use medication properly. In most cases, medication can control symptoms, allowing children to fully participate in activities, including sports. (Sawicki & Haver 2023.)

Effective treatment of asthma in children can improve the disease's prognosis and following the doctor's instructions can enhance the child's quality of life (Chang 2011). The long-term goals of treating asthma are to lessen and eventually eradicate the symptoms. Asthma should have a minimal influence on a child's life, when managing the disease properly. (Hengitys 2023.)

4 Treatment of asthma with medication

Asthma can be treated with different kinds of asthma medications. Medication for asthma includes inhaled cortisone, which reduces inflammation, and short- or long-acting medications that dilate the airways. Short-acting medicines, for example, Ventolin can be used as asthma attack medicine. Inhalable asthma medications are in powder or spray forms. With the help of a spacer, the nebulized medication is inhaled slowly and deeply. Powdered medication can be inhaled more quickly and does not require spacer. Numerous varieties of inhalers necessitate proper instruction from a healthcare professional for both the child and the guardian to use effectively. (Allergia-, iho- ja astmaliitto 2021.)

Children can be afraid of medication and neglecting treatment may lead to the disease becoming chronic. Therefore, explaining to the child and guardian that taking medications is preferable to suffering from symptoms is important. Cough, shortness of breath, wheezing, and other exertion-related symptoms are treated and prevented by medication that opens the bronchial passages. For example, leukotriene blockers can be used as asthma treatment in tablet form. Leukotriene blockers reduce inflammation and bronchial tube dilation, but their asthma-reducing efficacy is less than in cortisone. (Duodecim 2022.)

The tablet form may be sufficient for the initial treatment of mild asthma, often used additionally with other medications, such as enhancing the action of inhaled cortisone. Chronic rhinitis and sinusitis sometimes make asthma symptoms worse, therefore treating the

upper respiratory tract with a corticosteroid, antihistamine, and nasal rinse nasal spray is an essential part of treating asthma. (Duodecim 2022.)

4.1 Anti-inflammatory drugs for asthma

Inhaled cortisone medications, such as beclomethasone, budesonide, and fluticasone, are known as asthma anti-inflammatory medication used to reduce inflammation of the bronchial tubes associated with asthma. When used daily, the medication can effectively control symptoms with less risk of adverse effects on the body compared to oral cortisone. Cortisone medication can be reduced or used intermittently if the child's asthma is asymptomatic for a long time. (Duodecim 2022.)

A hoarseness of the voice, yeast infections of the mouth and pharynx are common side effects of inhaled cortisone medications. Cortisone treatment in the form of a tablet such as prednisolone is usually only used in the worsening phase of asthma if inhaled medications are ineffective. (Terveyskylä 2021.) If a child with asthma has a severe condition requiring continuous cortisone medication, monitoring for adverse effects is crucial. These effects can include mood swings, thinning skin, and fragility of the bones. Terveyskylä (2021) states that there is no need to be concerned about long-term negative effects if less than two courses of cortisone tablets are taken in a year.

4.2 Bronchodilators

Bronchodilators relax the smooth muscle of the bronchus, allowing the bronchi to open. Dilating medications (bronchodilators) do not lessen mucous membrane edema. Examples of bronchodilator medications are salmeterol, formoterol, and salbutamol. As a side effect of dilating medications, palpitations and trembling may occur. Salbutamol and terbutaline, two of the dilating medications, are quick-acting and can be used to prevent symptoms, for instance before exercise. Long-acting opening drugs, for example formoterol and indacaterol, are switched to if cortisone medication and the occasionally used short-acting opening drug are not enough to relieve symptoms. (Duodecim 2022.)

A long-acting drug's duration of effect is 12-14 hours, while a short-acting drug's duration of action is approximately 4 hours. When regular anti-inflammatory medications are insufficient, and short-acting bronchial drugs are needed frequently, long-acting bronchodilators can be added to the treatment. Relying solely on bronchodilators is not recommended, as these medications do not address asthma inflammation. Using bronchodilators alone can mask

inflammation symptoms and potentially worsen the underlying asthma condition. (Terveyskylä 2021.)

Bronchodilators can also help remove mucus from the lungs. As the airways expand, mucus passes easier, allowing the child to cough mucus out of the body a lot easier. The most common forms of bronchodilators are inhalers and nebulizer solutions. Acute sudden asthma symptoms can also be treated with short-acting bronchodilators. Long-acting bronchodilators should be administered every day to prevent asthma attacks. (Almadhoun & Sharma 2023.)

4.3 Combination medications

If long-term opening medication must be begun in addition to corticosteroid therapy, a pharmacological combination is discussed (Hengitys 2023). If both medications are required daily, combination solutions with cortisone and a bronchodilator can be utilized. In combination preparations, anticholinergic inhaled medications including glycopyrronium, ipratropium, and tiotropium are also utilized as supplementary medications to lessen bronchoconstriction. Headache, dry mouth, dizziness, and constipation are possible side effects of the medicines. (Duodecim 2022.)

Combination inhalers are a type of medication used to manage and control the symptoms of asthma while also helping to prevent asthma attacks. These inhalers typically contain a combination of two types of medication: a corticosteroid, which helps reduce inflammation in the airways, and a long-acting beta (LABA), which helps relax the muscles around the airways. By using combination inhalers as prescribed, individuals with asthma can achieve better asthma symptom control and reduce the risk of experiencing severe asthma attacks, ultimately improving their overall quality of life and respiratory health. (Bass 2023.)

4.4 Oral treatment

Children may face challenges with the unpleasant taste and suddenness of inhaled asthma medication, which can lead to improper usage. Consequently, instead of effectively reaching the lungs, inhaled medications can remain on the teeth, gums, and tongue. Inhaled medication often contains additives that alter saliva composition, potentially leading to issues like gum irritation, dry mouth, and cavities when the medication remains in the mouth. (Harrington, Prado & Barry 2016.)

Oral health care is an essential part of asthma treatment. The teeth are brushed before taking the medication. Plaque-covered teeth will not absorb the medication as well. After

teeth have been brushed asthma medication is administered, followed by rinsing mouth to get rid of any residue. Inhaled cortisone medications can cause infections in the mouth and pharynx. Rinsing the mouth and throat after administration of medication will prevent yeast infections. In addition to rinsing, xylitol chewing gum, or a tablet may be beneficial. (Duodecim 2022.) The teeth should not be brushed immediately after taking the medication so that the tooth enamel won't get damaged (Allergia-, iho- ja astmaliitto 2020).

5 Asthma medications with inhalers

One of the main types of treatment for asthma is the inhalation of medications (Mäkelä et al., 2020, 424). Medications for asthma that can be inhaled come in spray or powder form. From the inhaler, the device designed for it, the medication is dosed and breathed. To inhale medications, one can employ dose aerosols with or without a space extension, powder dispensers, and medicine nebulizers. (Terveyskirjasto 2022.) The nebulized medicine is inhaled long and calmly, mostly through a space extension. The space extension gives more time to inhale the medicine. Powdered medicine is inhaled more quickly than nebulized medicine and does not require a separate space extension. Numerous inhalers are available. If all asthma medications are administered with the same inhaler, the administration of the medicine is easier. (Allergia-, Iho- ja Astmaliitto ry, 2021.)

The main advantage of inhaled drug therapy is the reduction of systemic side effects. Medications, such as glucocorticoids, that have significant side effects when dosed systemically in other areas of the body are recommended to administer via inhalation. Challenges in inhalation are the technical complexity and cost of manufacturing the inhaler, the patient's ability to use the inhaler appropriately, and local discomfort in the mouth and pharynx. The powder inhaler, propellant gas aerosol, pharmaceutical mist inhaler, and nebulizer are the most frequently used inhalation administration devices. For the medicine to be effective, selecting an appropriate pharmaceutical inhaler for the patient and providing clear instructions on how to use the device are crucial. (Mäkelä et al., 2020, 424.)

For all devices, the same fundamental instructions apply. Before inhaling the medication, carefully cough out the mucus. The bronchial tubes constrict as a result of a vigorous and forceful cough, which impairs the medication delivery. Exhaling with a sigh. After inhaling the medicine, the breath is held for 5-10 seconds, giving the medicine particles time to stick to the mucous membranes of the bronchial tubes. Avoid breathing into the machine. Inhaler becomes wet from steam, and in this instance, some of the medication may stay on the device's wall. (Terveyskirjasto 2022.) With various breathing devices, typically 10 to 30 percent, and at best 50 percent, reach the lungs. The remainder of the medication is still in the mouth and pharynx, where inhaled medicine can either be swallowed or immediately

absorbed into the bloodstream through the mucous membrane. The parameters of the inhalation device, successful inhalation, and the drug particle size are critical to the effective dosage of inhalation medications. (Mäkelä et al., 2020, 424.)

When inhaled into the respiratory tract, therapeutic particles may reach the mucosa by impaction, sedimentation, or diffusion. Larger particles have a greater impact on the mouth, throat and large airways, while smaller particles travel deeper into the bronchial tubes and settle on the mucous membrane. The smallest particles reach the alveoli through inhalation and mainly through diffusion to the mucous membrane. Some of the drug particles leave the body during exhalation. (Mäkelä et al., 2020, 424.)

Inhalable medicines for children under 5 years of age should be given as an aerosol and using a spacer. An asthma medicine mask is used by children up to the age of 3. The mask lessens the accumulation of drugs. The recommended dosage of the medication is during peaceful, relaxed breathing. Crying while taking medication lowers drug deposition. (Käypähoito 2022.)

5.1 Powder dispenser and pressurized metered dose inhaler (pMDI)

The inhalation force needs to be strong enough for the powder inhaler to release the medication from the device adequately in order to be used effectively. Compared to the use of a propellant aerosol, the powder inhaler is easier to use, as there is no need to schedule the drug intake at the same time as charging the device. The newest powder inhalers have smaller particle sizes than previous models, which promote lung deposition and lessen pharyngeal deposition. Some powder inhalers contain an automated release mechanism that only allows the medication to be released when the inhaling rate is appropriate. (Mäkelä et al., 2020, 427.) Typically, children can start using powder inhalers (e.g. Easyhaler) in preschool (Terveyskylä 2018).

In a propellant aerosol, the medicine and the propellant are combined in a small spray bottle. Pressing the dispenser releases a dose of the medicine. Strong inhalation is not necessary, but activating the device at the beginning of inhalation is important. The medicine can be in the form of suspension or a solution. Suspension aerosols have larger particles that stay mostly in the mouth and throat, while solution aerosols have smaller particles that are better absorbed into the lungs and leave less residue in the mouth and throat. The timing of device activation is important for propellant aerosols, and newer designs help synchronize drug release with inhalation. (Mäkelä et al., 2020, 427.) Use an appropriate dosage container (such as a Volumatic, Babyhaler, or OptiChamber Diamond) when administering medications in a propellant nebulizer. These dose containers must also have a face-mask portion for little children. (Terveyskylä 2018.)

5.2 Dose aerosol with a space extension and nebulizer

Typically, spacers are plastic chambers with a 100-1500 ml volume. A propellant aerosol is used to spray the medication from one end of the space extension, and the patient inhales the medicine from the other end. The usage of the extension lessens the amount of propellant aerosols that enter the mouth and throat as big droplets. If used properly, the space extension might enhance lung deposition. The necessity to precisely schedule the release of the aerosol to the start of inhalation is removed using a spatial extension. Small children who struggle to take inhaled medications can have the medication sprayed into the spacer, where they can then breathe normally while wearing a mask attached to the space extension under the supervision of a nurse or parent. (Mäkelä et al., 2020, 427.)

A nebulizer is a machine that consists of four parts: the motor, mouthpiece/facemask, cup, and tubing. Medication is put into the cup and the machine sends a mist into the mask, which the child can breathe in. The child does not have to do anything except stay still and breathe in. Taking about 5-10 minutes to breathe in all the medicine, helping the child stay still and calm during treatment is important. (Ben-Joseph 2017.)

6 Children patient guidance

When caring for a child, considering the child's age, developmental level, and potential diseases is important. Both the child and the parents are considered in the guidance situation. A play-age child's care must be entrusted to the parents. Giving the child enough time to investigate their environment is crucial when providing guidance. (Storvik-Sydänmaa, Tervajärvi & Hammar 2019, 118 - 123.) When guiding a child patient, their unique capacity to tackle difficulties through play should be considered. For an infant or toddler, understanding therapies and their purpose might be challenging. Giving time for a child to play before the treatment supports the understanding of the treatment. (Tehy 2019.) The words used to guide the play-aged child must be clear. Various mobile applications made for children's guidance can utilize in patient guidance with children. To keep the child's interest, employ several forms of guidance. Written instructions support verbal guidance. (Storvik-Sydänmaa et al., 2019, 118 - 123.)

The nurse must provide the child and family with precise instructions. Children from 1-3 must constantly have their parents take care of their asthma. The aim of each asthma medicine as well as the recommended dosage should be understood by the child and parents. How to operate and maintain the equipment should be covered in the instructions. The proper manner to provide inhaled drugs to children should be explained to parents. Highlighting the

importance of dental hygiene is essential. The PEF measurement and the proper administration of medications must be explained to parents. (Storvik-Sydänmaa et al., 2019, 225.)

6.1 The nurse's role in the guidance of a child patient

Recognizing children's cognitive abilities and thinking processes vary from adults and require good interaction between the child, parents, and the caregiver to achieve successful guidance (Hämeen-Anttila 2018). Health care providers play an important role in guiding families of children with asthma by providing comprehensive education and convey clear information about the condition. Practical advice on using medicines, creating a suitable environment, and promoting open communication are essential for nurse when guiding families (Mäkelä & Jartti 2020, 373).

Determining the family's information and guidance needs is crucial. The timeliness of providing information and assistance at the appropriate moment must also be considered. The chance is provided for the child and family to ask questions while being encouraged to implement the drug treatment program. In consultation with the parents, matters pertaining to the child's environment and household are reviewed. Parents are advised to quit smoking. In guidance, parents are taught to observe the child's breathing and asthma symptoms. (Storvik-Sydänmaa et al., 2019, 224.)

In relation to medication, the nurse's task is to ensure that the child's prescribed asthma medication is given correctly and at the right time. The nurse provides information about asthma, managing asthma and symptom recognition to the whole family. Offering explanation of basic information, advising on avoiding triggers, monitoring symptoms, and providing emergency situations are few examples of what guidance can be. (Munde 2017.)

Guidance takes place in a clear and understandable way, considering the family's cultural, linguistic, and individual needs. Also, to support and motivate the child and family in controlling asthma. Follow-up care is an essential part of the nurse's duties. The nurse monitors the child's asthma control and, if necessary, makes regular checks. This helps to evaluate the effectiveness of the treatment. (Belleza 2021.)

Maintaining the child's calmness is crucial for the efficient administration of medication. The medication can be given playfully to a toy or parent to help ease the child's anxiety. Avoiding crying delays the medication from reaching the bronchial tubes. (Allergia-, iho- ja astmaliitto 2023.)

Parents need to encourage a child to stay physically active while also taking steps to avoid factors that can worsen asthma symptoms (Mäkelä & Jartti 2020, 373). By engaging families in personalized care plans and prioritizing their participation and education, healthcare providers empower parents to effectively manage their child's health. In result for a better outcome and a good quality of life of the child. (Kashaninia, Payroovee, Soltani & Mahdavian 2018.)

6.2 Choice of inhalation devices and inhalation techniques for children

Proper medicine taking technique and the selection of an appropriate medicine device for a child's age are important for the medication to be effective. Inhalers come in two forms: nebulized and powdered medicines. Nebulized medicines are preferred for children as their inhalation strength and coordination are not yet sufficient for powdered medicine. Children under three years of age require a mask to use nebulized medicines. Powdered inhalers are suitable for preschool-age children and older but require a strong inhalation to be effective. (Allergia-, iho- ja astmaliitto 2020.)

Children should be taught the proper inhalation technique using a device appropriate for their age and medicine-taking technique should be practiced with the guidance of a doctor or nurse. The spacer extension should be used horizontally, and the mask should fit the child's mouth and nose tightly when being used. (Allergia-. Iho- ja astmaliitto 2023.) Keeping the child calm during the medicine administration process is crucial for efficient medication delivery. The medication can be given playfully to a toy or parent to help ease the child's anxiety. (Allergia-, iho- ja astmaliitto 2023.) Parents need to encourage a child to stay physically active while also taking steps to avoid factors that can worsen asthma symptoms (Mäkelä & Jartti 2020, 373).

6.3 Common mistakes in inhalation technique

Incorrect inhaler technique is prevalent among asthma patients, with both children and adults demonstrating high rates of improper use (National Asthma Council Australia 2016). Common mistakes in administering inhaled asthma medication include exhaling before taking the medicine, leaving the mouth open after inhaling, administering two doses at once, tilting the head back while inhaling, dispensing the medicine into the air instead of inhaling, not checking the medicine before dosing, using the device upside down, and inhaling too weakly or briefly (Allergia-, iho- ja astmaliitto 2023). Crying during medication delivery lessens drug deposition (Käypähoito 2022).

Parents should actively supervise their child's inhaler use to ensure proper timing and technique. Learning the correct inhalation method is crucial. However, some parents mistakenly assume their children can "outgrow" asthma, potentially leading to neglecting treatment. Recognize that asthma is a chronic condition necessitating ongoing medication for control. (Beadle 2023.)

6.4 Side effects of asthma medications

Like any medication, asthma drugs have potential side effects that can range from oral thrush and nervousness to glaucoma, which may vary based on the drugs class, dosage, and method of delivery such as inhalation or orally. While most asthma medications are well-received, the advantages of treatment typically surpass any drawbacks. Nonetheless, there might be instances when a side effect becomes sufficiently severe to warrant a dosage modification or a shift to an entirely different medication. (Bass 2022.)

The primary negative long-term effect of inhaled corticosteroids in children is a decrease in height growth (Käypähoito 2022). Corticosteroid-based inhaled medications primarily have localized effects, making them safe when used at recommended doses. Some individuals may encounter side effects like hoarseness or dry mouth. Bronchial-opening inhaled medications can occasionally lead to temporary symptoms like heart palpitations and hand tremors. These symptoms are benign and pass quickly. (Allergia-, iho- ja astmaliitto 2023.)

7 Educational video

Utilizing educational videos proves to be a compelling method for presenting information in an engaging manner. Learning through video resources can be just as effective as traditional in-person-instruction in terms of educational outcomes. Additionally, from an accessibility perspective, videos serve as a valuable enhancement to the teaching and learning process. (Kuokkanen 2019.)

According to TechSmith (2023), educational videos have gained popularity among educators and students due to a variety of advantages. The flexibility of educational videos has been established as the preferred method for content delivery, whether for online courses or as a complement to face-to-face classes, providing dynamic and engaging resources that resonate with today's learners. Video length is a fundamental component of a video design. Effective educational videos should be concise, favoring brevity over excessive length, even in the case of screen capture videos. Producing several shorter video clips is advised if the

subject is broad. Typically, videos should ideally not exceed 2 minutes in length, and any video longer than 6 minutes should have a compelling reason for the extended duration. Shorter videos are more likely to be watched in their entirety. (Kuokkanen 2019.)

The focus is on creating an educational video for nursing students. This educational video serves as a practical and visual resource for showing nursing students the correct methods of administering inhaled asthma medication to children. By creating an educational video about the chosen subject, this thesis demonstrates a hands-on approach to nursing education. This thesis offers a practical resource that directly relates to the topic of administering inhaled asthma medication to children aged 1-3, providing nursing students with a visual and informative guide to enhance their understanding and skills in pediatric asthma care.

8 Working life partner

Laurea University of Applied Sciences (Laurea UAS) is in Uusimaa region and has six separate campuses in Otaniemi, Leppävaara, Tikkurila, Porvoo, Hyvinkää and Lohja. Laurea UAS community comprises approximately 9,900 students, 660 employees, and 34,700 alumni. Laurea offers a range of degree programs, including business management, social services and health care and hospitality management. The duration of full-time studies typically spans from 3,5 to 4,5 years. (Laurea 2023.)

At Laurea, education goes beyond theory, as learning occurs through research, reflection and collaborative development activities with teachers, fellow students, and professionals. This approach allows for the development of a robust knowledge base, practical skills, creative problem-solving abilities, and the competence required for one's profession through participation in real-world development projects. Laurea's strong connections with employers enable students to establish valuable contacts in the job market during their academic journey. This approach, known as Learning by Developing (LbD), is integral to all studies and emphasizes the active pursuit of solutions for real-life challenges arising from the working world. (Laurea 2023.)

Nursing studies at Laurea emphasize practical learning with lectures, workshops, and simulations exercises. Registered nurses focus on holistic wellbeing for individuals, families, and communities, prioritizing health promotion, disease prevention, and treatment. Effective interaction and communication skills are vital in the field. The nursing program at Laurea offers a day-time format with diverse multicultural student groups. (Laurea 2023.)

9 The purpose and aim of the thesis

The purpose of the thesis is to create an educational video in English that demonstrates the proper administration of inhaled asthma medication for nursing students. The aim of the thesis is to increase the skill of nursing students regarding inhaled asthma medication, the required equipment, and the administration of asthma medications for children aged 1-3 years.

10 Thesis process

10.1 Functional thesis

A functional thesis is a type of academic work that focuses on solving real-world problems or addressing practical challenges, often involving the development of tangible outcomes such as products, instructions, services, plans, concepts, or models. Typically based on the needs of working life and may have an external client or be directed toward one's own business or entrepreneurial idea. Designing functional work often takes more time than just written work. (Metropolia 2020.)

At the University of Applied Sciences level, one approach to thesis writing is the functional thesis. This method utilized educational videos to demonstrate theoretical knowledge through simulations of real-life scenarios in the final product. The functional thesis can result in various forms, such as books, files, maps, guidebooks, posters, websites educational videos, or portfolios. A functional thesis always includes both a detailed report and the tangible final product, offering a practical and comprehensive representation of the writer's expertise. (Vilkka & Airaksinen 2003, 145.)

10.2 Educational video planning and implementation

The planning and implementation of the educational video started by studying and internalizing theory about asthma in children, and the criteria of a good educational video. The objective was to make the video to be short, simple, and succinct. The intention was to include as much theoretical information as possible so that viewers could acquire all the information from the video directly. The educational video on the administration of inhaled asthma medication to 1-3 years old children can provide nursing students with valuable insights into age-specific care, medication administration, communication, cultural competence, evidence-based practice, ethics, and collaboration. Educational video can

enhance nursing students understanding of pediatric nursing and help them apply these principles to their ongoing studies and clinical practice.

When searching for prior educational materials for Laurea's degree nursing, the concept for the thesis, and educational video emerged in February 2023. Not many English-language educational videos were found in the degree nurses' educational resources. The educational video is considered a useful and understandable method of instruction, and no English-language video about administering inhaled asthma medication to children has been previously produced by Laurea.

Theoretical information and the script related to the educational video was searched and retrieved from different electrical databases and search engines such as Laurea Finna, Laurea's library, Theseus, Terveysportti, Duodecim, CINAHL, Youtube, Google and Google Scholar. Keywords such as asthma, children 1-3 years, inhalation, medication, asthma equipment's, educational video, audio-visual learning, nursing student, and interaction with a pediatric patient are being focused on. The reason behind using these sources for the script is that the authors aim to create an educational video from a Finnish nursing perspective. Sources in both English and Finnish languages were chosen for the theoretical information for script writing. The sources that have been used mainly were published between 2010-2023.

The video production process included steps such as identifying goals and target audience, distributing roles, scriptwriting, location selection and equipment gathering. Prior to filming, the authors obtain permission to use Laurea University of Applied sciences facilities, and equipment. A research permit to film was applied from Laurea once the thesis plan had been accepted. The educational video was produced in collaboration with Laurea University of Applied Sciences.

A total of 3 nursing students appeared in the educational video. The first student took on the role of the registered nurse, the second student portrayed the child's parent, and the child itself was represented by a doll. Furthermore, the third author not only appeared in the final scene but also served as the narrator, responsible for video recording, handling filming equipment, and managing the editing process. The educational video was 3 minutes 31 seconds long.

An educational video was filmed after the thesis plan had been accepted and the research permission had been obtained. The video was recorded with a DSLR camera and edited with iMovie program by the authors. The script includes text to be included between scenes. The educational video contains still images with text.

The educational video was sent to the Laurea UAS representatives after filming. The author's thesis process is guided by two supervisors. The video was sent to the pediatric teacher of nursing at Laurea, who then offered recommendations for improvement. Once the educational video was filmed and edited into final version, video was sent to the authors' supervisor, who forwarded it to final-year degree nursing students. The feedback was gathered anonymously using a questionnaire. The author's supervisor sent the questionnaire to Laurea's bachelor's degree programme in Nursing who are final year nursing students. The questionnaire was done by Google Forms and the responses were gathered by Google Forms into the same questionnaire platform. The authors used a bar chart to create diagrams illustrating the feedback results.

A bar chart can provide a quick and clear overview of questionnaire performance. Bar charts are effective for displaying categorical data and can help visualize the distribution and relative performance of different categories. (Yi 2023.) After the final thesis has been accepted, educational video will be uploaded to Laurea University of Applied Sciences' Youtube channel, enabling instructors and nursing students to watch the video.

10.3 Educational video evaluation

Gathering feedback is an essential step in the development and enhancement process. Feedback will be gathered following the completion of the educational video to assess whether the authors have achieved their intended objective. In this case, is to create a high-quality educational video of the administration of inhaled asthma medication to children aged 1-3 years old.

The authors used an online tool known as Google survey form. The educational video, the questionnaire and an invitation letter were sent via Microsoft Outlook email to one of the authors' supervisors and she forwarded it to final stage nursing students for the evaluation. Thus, the authors will not be handling personal data. The feedback questionnaire consisted of five questions. Questions were close ended on a scale from 1 - 5 (Strongly disagree, disagree, neutral, agree, strongly agree). The participants were given 1 week to answer the questionnaire.

A well-designed survey should have short, easy-to-understand instructions and responses. Well-considered questions improve the value and reliability of the results (OAMK 2020). Participants were informed that the feedback process is anonymous, and participation is voluntary. The authors used the feedback only for the purpose of the thesis. In the analysis process, only the feedback that contained responses to all five of the listed questions is

considered. The bar chart was chosen for the feedback reporting due to its ability to quickly convey an overall picture of questionnaire performance. Bar chart can provide a quick and clear overview of questionnaire performance. Bar charts are effective for displaying categorical data and can help visualize the distribution and relative performance of different categories.

The questionnaires will include the following questions:

1 - 5 (Strongly disagree, disagree, neutral, agree, strongly agree).

1. The video effectively demonstrated administering inhaled asthma medication to children 1-3 years old (1 - 5)
2. The video provided guidance on administering inhaled medication for children (1 - 5)
3. The length of the educational video was appropriate (1 - 5)
4. The content of the educational video was in a logical order (1 - 5)
5. The video was helpful considering my nursing study and future nursing career (1 - 5)

The research permit was granted by Laurea University of Applied Sciences in December 2023, and the authors promptly initiated video production. Having prepared the manuscript in advance, the authors focused on classroom setup and acquired the necessary equipment, including a doll, from Laurea. The authors successfully booked a classroom for filming and completed the entire process in a single day without any issues. Following the filming, the editing process commenced. One of the authors, equipped with video editing experience, efficiently managed the editing without encountering any challenges. The editing phase spanned approximately one week. Before finalizing the video, the authors sought evaluation and feedback from a pediatric teacher. After receiving her input, the authors incorporated suggested changes, ensuring the video met the required standards. Reshooting the scenes was not necessary for the video; instead, the scenes' order needed to be altered. With these adjustments, the video was deemed complete and ready for distribution to nursing students. The educational video turned out as desired, clear, and simple. The authors were satisfied with the final product.

The feedback on the educational video indicates overall positive responses. The survey was answered by a total of six students. Each participant answered all five survey questions. Most students strongly agreed that the video effectively demonstrated the administration process, provided guidance, and had an appropriate length. Additionally, most students found the content to be in a logical order. However, one student strongly disagreed with the video's helpfulness for nursing study and future nursing career. These divergent opinions highlight the importance of addressing specific concerns raised by individual students for further improvement.

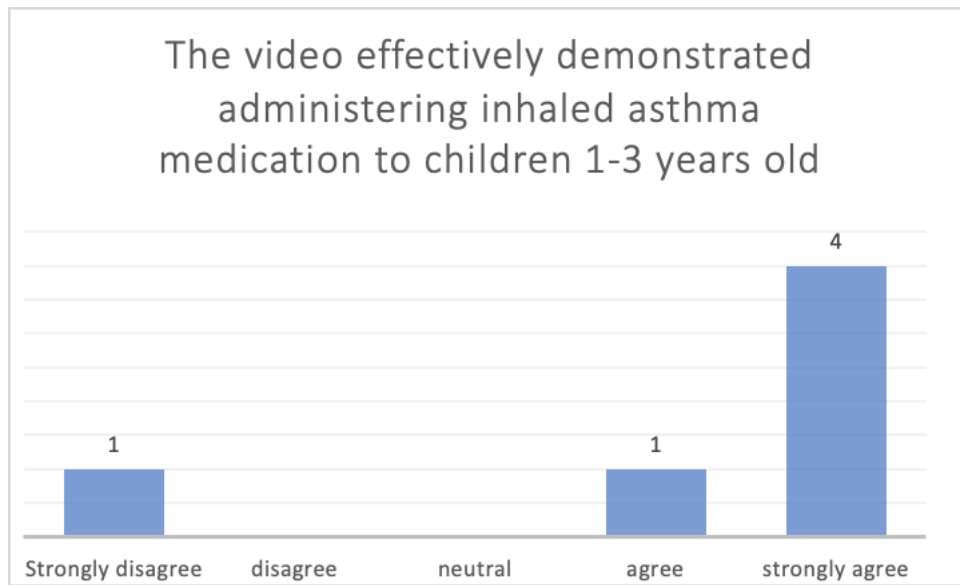


Table 1: The video effectively demonstrated administering inhaled asthma medication to children 1-3 years old

The first question on the feedback asked if the video effectively demonstrated administering inhaled asthma medication to children 1-3 years old. 4 students answered that they strongly agreed, one student responded that they agree, and one student responded to strongly disagree.

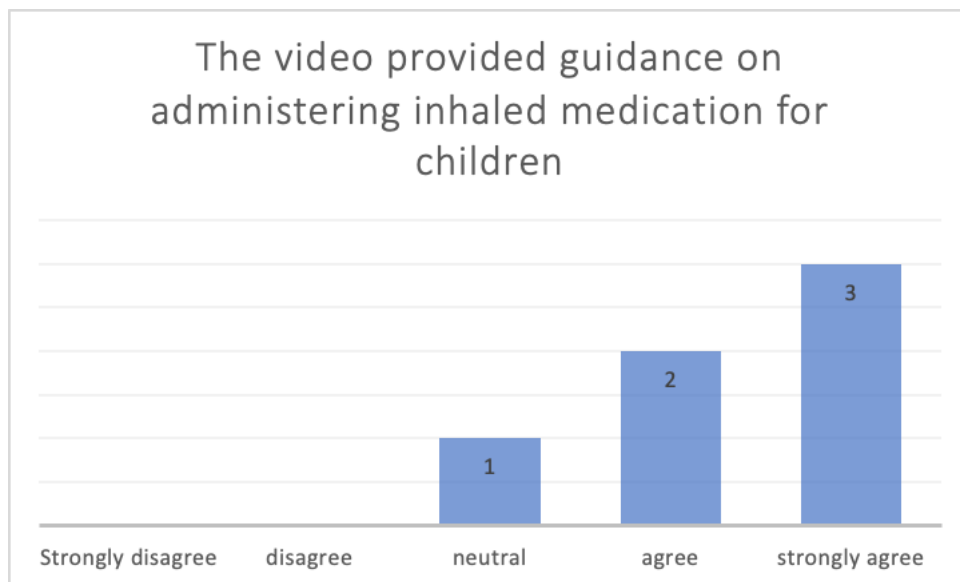


Table 2: The video provided guidance on administering inhaled medication for children

The second question on the feedback asked if the video provided guidance on administering inhaled medication to children. Three students answered that they strongly agreed, two students responded that they agree, and one student responded neutral.

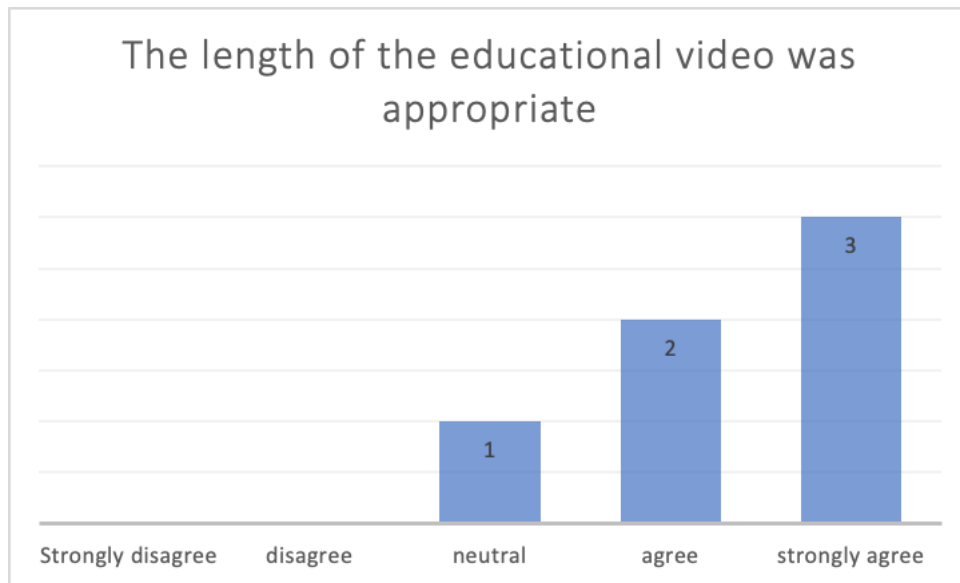


Table 3: The length of the video

The third question on the feedback asked if the length of the educational video was appropriate. Three students answered that they strongly agreed, and two students responded that they agreed, and one student responded neutral.

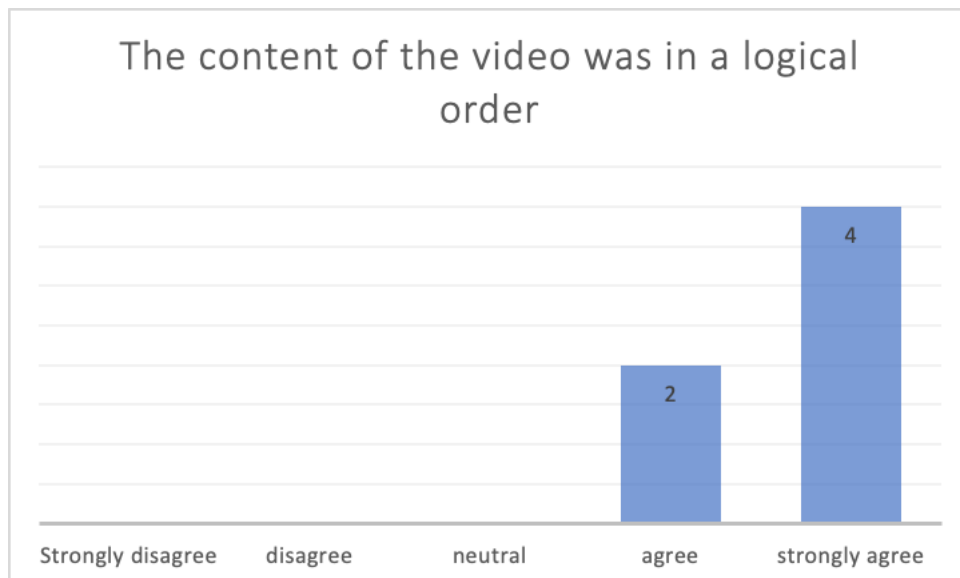


Table 4: The content of the video was in a logical order

The fourth question on the feedback asked if the content of the educational video was in a logical order. Four students answered that they strongly agreed, and two students responded that they agreed.

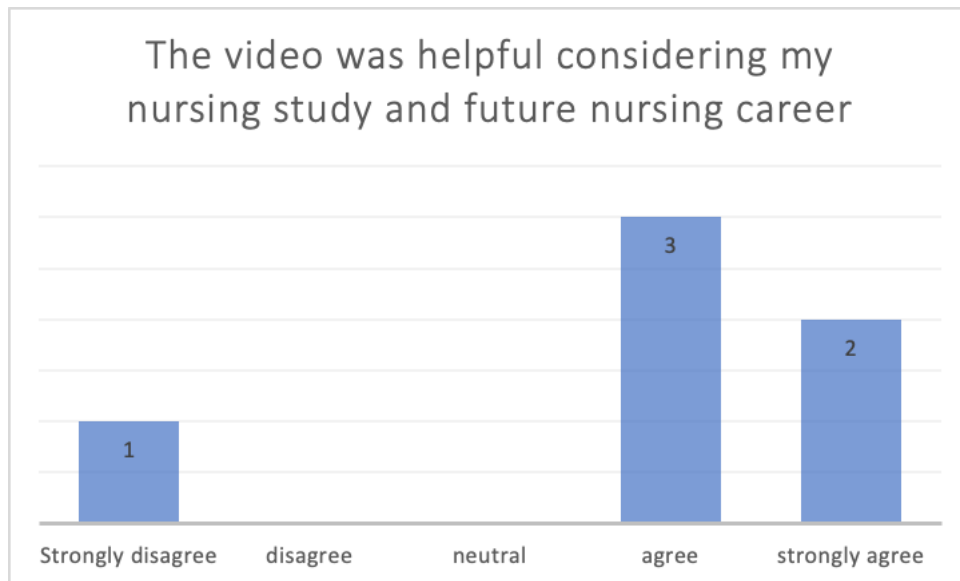


Table 5: The video was helpful considering my nursing study and future nursing career

The fifth question on the feedback asked if the video was helpful considering nursing study and future nursing career. Two students answered that they strongly agreed, three students responded that they agree, and one student responded strongly disagree.

11 Discussion

The purpose of the thesis was to create an educational video in English that demonstrates the proper administration of inhaled asthma medication for nursing students. Since the authors wanted to create an educational video to support nursing students' learning, the authors decided to use the functional thesis method. Laurea University of Applied Sciences did not have an educational video on this subject so the idea of producing this video was certainly necessary, and beneficial. The authors wanted to deepen their understanding of children's respiratory tract anatomy to understand better what asthma is and how asthma can be treated. Authors searched information of asthma symptoms, diagnosis, and treatment with different medications. The authors managed to put together a broad theoretical framework to support the producing of an educational video.

Authors believed in setting clear goals and milestones, breaking down the entire process into manageable tasks. The authors created a detailed timeline that included specific deadlines for the thesis plan, applying research permit, filming and editing, data collection, analysis, and drafting chapters. The authors also allocated time for revisions and feedback from the supervisors. While writing the thesis, the authors were in practical placements and working part-time jobs. One of the challenges authors faced was the balancing between work

responsibilities and the demands of the thesis. The authors also faced challenges due to differences in their timetables. To overcome this issue, the authors prioritized tasks and dedicated specific days exclusively to thesis work. Zoom played an important role in the process of writing the thesis. The authors maintained open communication among each other, ensuring they were aware of each other's commitments. The entire thesis process supported and enhanced the authors' nursing skills.

11.1 Ethical consideration

Ethics in research and publication is about right and wrong, and it is a fundamental aspect of quality research. Ethical consideration protects researchers' rights and participants. Ethical principles are crucial throughout the research process (Astedt-Kurki & Kaunonen 2018). Scientific research should adhere to the principles of good scientific practice to ensure ethical acceptability and reliability. Key principles of good scientific practice encompass honesty, precision in research activities, meticulous scrutiny of research and its outcomes. Researchers are also expected to show respect for the work of their peers and duly acknowledge and reference their publications when integrating them in their own research. (Tenk 2023.) Arene (2023) emphasizes in the university of applied sciences thesis process that greater consideration should be given to the management of personal information and the implementation of data protection for individuals who are the subject of the research.

In this thesis, strict ethical guidelines were followed to prevent potential ethical issues. Reliable scientific sources were used to gather the theoretical background. Additionally, strict adherence to Laurea University of Applied Sciences' referencing guidelines ensured proper citation and referencing of sources. In this thesis, integrity is maintained by avoiding dishonesty, fabrication, and falsification. The authors consent for their names to be included at the beginning and the end of the educational video. The project places a high priority on individual safety, and to address concerns about child movement potentially interfering with the recording process, and artificial representation of a child doll will be utilized in the educational video. This ensures that the recording process remains undisturbed.

The authors obtained a permit from co-partner in accordance with the university's guidelines to conduct their research and film the educational video. Companies and organizations must adhere to strict guidelines governing the gathering, storing, and handling of personal data, as outlined in the General Data Protection Regulation. The General Data Protection Regulation has strict rules that data processing is based on consent. The purpose of these rules is to ensure that a person understands what they are agreeing to. On the website, consent can be

given by checking the box. (YourEurope 2022). When consent is clear, specific, informed, and genuinely voluntary, it is considered legitimate (Tietosuoja 2023).

After producing the final educational video, the authors collected feedback from nursing students in a manner that prioritized anonymity and confidentiality. Before the survey, students were asked for permission to use the collected data only for the purpose of this thesis, gathered from the feedback questions considering the evaluation of the educational video. Consent was given by checking the box on the website. The questionnaire was designed so that the students would answer the questions anonymously. The collected data was destroyed after analysis. The feedback questionnaires were carefully designed to avoid any ambiguity and to ensure that participants' religious, cultural, and ethnic background were respected. Participants were informed that their participation would not be compensated, and they could withdraw from the process at any time. Emphasizing that participants' responses would solely contribute to the improvement of the project.

11.2 Reliability

Reliability refers to the consistency of a measurement. A test is considered reliable when consistently producing the same results under the same conditions (Shuttleworth & Wilson 2023). In evaluating the reliability of the research, consideration is given to how truthful the information provided is (Kylmä, Vehviläinen-Julkunen & Lähdevirta 2003).

The research was carefully chosen from reliable health sector databases and assessed according to critical guidelines to address the research questions.

The thesis research's reliability is evaluated, and potential bias is minimized. The authors ensured that their research and the final product were based in the latest, reliable sources, adhering to Laurea UAS referencing guidelines. The work integrates evidence-based practices from both Finnish and international contexts while maintaining a commitment to accuracy and quality. The references in this thesis have been formatted in accordance with Laurea's thesis guidelines.

The reliability of this thesis increases because the authors used national and international up-to-date sources. In the thesis, several sources supported each other, which strengthens the reliability. The scientific information used were mainly no more than 10 years old. A couple of older sources had to be used because newer sources could not be found. Expandability refers to the ability for another researcher to continue the study by having the complete research procedure documented (Kylmä & Juuvakka 2007, 129).

This thesis procedure was accurately documented by the authors in this report, enabling the reader to follow the thesis journey in every step. The educational video was reviewed by the pediatric teacher, and corrections were made based on her feedback. The authors regularly participated in thesis seminars during the thesis process. Thesis supervisor teachers provided feedback to the authors during the seminars, and the thesis was enhanced in accordance with their recommendations. The thesis was written by three authors. Multiple authors' contributions can offer a more comprehensive viewpoint on the topic. Diverse perspectives, experiences, and fields of expertise can enhance the thesis and add additional valuable data. Multiple rounds of revision and correction steps were possible in the work because of several authors. This lowered the number of mistakes and raised the standard of the work as a whole. Since there were many authors, the use of information sources was more abundant.

The ability of a qualitative study to be generalized or applied to a different setting is referred to as transferability. In order for the reader to evaluate the results' transferability, the researcher must provide sufficient, in-depth information on the research partners and the surrounding environment. (Kylmä & Juuvakka 2007, 129.) The educational video has been made as realistic and easy to understand as possible, and a natural nursing environment has been staged in the video.

Every thesis, regardless of its quality, may have limitations. Identifying and acknowledging these limitations is an important aspect of academic honesty and integrity. One of the limitations of this thesis was the English language. Since the writers' first language is not English, writing the thesis presented some difficulties. For example, much more work had to be done in terms of grammar. Another challenge in writing the thesis was the authors' limited time to work on the thesis. The authors were doing practical placements and part-time jobs during the writing of the thesis, which brought their own challenges to the process.

12 Conclusion and recommendations

The purpose of the thesis was to create an educational video in English that demonstrates the proper administration of inhaled asthma medication for children aged 1-3 years old for nursing students. The development of educational video stands to be a valuable resource in nursing education, ensuring that students acquire the necessary skills to provide effective care for young children with asthma.

This thesis investigated the impact of an educational video designed for nursing students on the administration of asthma medication to children aged 1-3. The results indicate that the educational video is a valuable tool in enhancing nursing students' knowledge and confidence

levels in pediatric asthma management. Positive feedback from nursing students about the educational video's ability to improve their understanding of pediatric asthma management and increase confidence in administering medication further supports the importance and effectiveness of this educational video.

In addition, this study highlights the broader importance of incorporating innovative teaching methods, such as educational videos, into nursing curricula. As the healthcare environment continues to evolve, the use of multimedia tools can enhance the learning experience and ensure that nursing students are well equipped to provide evidence-based, high-quality care to pediatric patients with asthma.

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Tables

Table 1: The video effectively demonstrated administering inhaled asthma medication to children 1-3 years old

Table 2: The video provided guidance on administering inhaled medication for children

Table 3: The length of the video

Table 4: The content of the video was in a logical order

Table 5: The video was helpful considering my nursing study and future nursing career

Appendices

Appendix 1: Manuscript

Appendix 2: Invitation letter

Appendix 1: Manuscript

Roles: Registered nurse (Pauliina Juvonen), child's mother (Jenna Piironen), child (the doll), a videographer (Ingrid Roivas), a narrator (Ingrid Roivas).

What happens in the scene?	Picture	Equipment's needed	Narrator
Scene 1: Title of the tutorial video.	The logo of Laurea, the title of the video, and the names of the authors: Ingrid Roivas, Jenna Piironen and Pauliina Juvonen.		
Scene 2: Needed equipment's.	Picture of the needed equipment: hand sanitizer, space extension, mask, toothbrush, bronchodilator, and anti-inflammatory drug.	Hand sanitizer, space extension, mask, toothbrush, bronchodilator, and anti-inflammatory drug.	Needed equipment's are space extension, mask, bronchodilator and anti-inflammatory drug, toothbrush, and hand sanitizer.
Scene 3: A nurse welcomes the parent and child in.	A nurse, a parent, and a child are in the room. The child is sitting on the mother's lap.	The doll.	The nurse welcomes the mother and the child in and explains to them what will happen.
Scene 4: The slide briefly describes bronchodilator and anti-inflammatory drugs.	The nurse is holding a bronchodilator and anti-inflammatory drugs.	Bronchodilator and anti-inflammatory drug.	Bronchodilator is administered before anti-inflammatory drug if needed. Bronchodilator improves the effectiveness of the anti-inflammatory drug and there should be 10- 15 minutes break between the administration of bronchodilator and anti-inflammatory drug.
Scene 5:	Nurse is holding the space extension.	Space extension.	For children 1-3 years old, space

The video shows the space extension.			extension is used. The medicine is dispensed into the space extension, where the child inhales the medicine.
Scene 6: The video shows a nurse disinfecting hands before the administration.	Video demonstrating hand disinfection.	Hand sanitizer.	Before the administration, the nurse disinfects hands. It is essential to use enough sanitizer, rinse and rub the hands with the right technique for at least 15 seconds.
Scene 7: A nurse brushing the child's teeth.	Picture of a doll, where the nurse is brushing the child's teeth.	Toothbrush and a doll.	When an anti-inflammatory drug is used, the child's teeth should be brushed before taking the medicine.
Scene 8: The video shows how to assemble the space extension.	Assembling the space extension.	Space extension and mask.	Assemble the space extension.
Scene 9: The video shows shaking asthma medication and attaching the inhaler to the chamber securely.	Demonstrating how to prepare asthma inhaler (shake the device) and attaching it to space extension.	Space extension, bronchodilator.	Make sure to shake your asthma inhaler 3-5 times while holding it upright. After shaking the inhaler attach the device into the space extension.

<p>Scene 10:</p> <p>The video shows the nurse giving a bronchodilator with space extension to a child.</p>	<p>Administering inhaled asthma medication to a child.</p>	<p>Space extension, mask, bronchodilator, and the doll.</p>	<p>Tightly set the space extension mask over the child's face. Dose the medicine into the space extension and instruct the child to breath in and out calmly 5 to 6 times.</p> <p>Crying during the administration reduces the drug deposition.</p>
<p>Scene 11:</p> <p>Break between the medications.</p>	<p>Still picture of the nurse, child, and the parent.</p>		<p>With the child aged 1-3 years old, it is necessary to take into consideration child's skills.</p>
<p>Scene 12:</p> <p>The nurse is giving anti-inflammatory medication.</p>	<p>Still, blurred picture of the nurse giving the anti-inflammatory drug.</p>	<p>Space extension, mask, anti-inflammatory drug, and the doll.</p>	<p>The nurse is administering an anti-inflammatory drug for the space extension where the child breathes the medicine. After the anti-inflammatory inhalation, the mouth should be rinsed with water.</p>
<p>Scene 13:</p> <p>The nurse washing the space extension.</p>	<p>Still, blurred picture of the nurse washing the space extension.</p>	<p>Space extension and mask.</p>	<p>Washing instructions of space extension vary by manufacturer. Always check the instructions of your manufacturer. In this video babyhaler was used where the washing instructions vary from others and the washing instructions follow babyhaler's instructions.</p>

<p>Scene 14:</p> <p>This video shows how to clean the space extension after administering the drug.</p>	<p>Demonstration on how to properly clean the space extension.</p>	<p>Space extension and mask.</p>	<p>First disassemble the space extension, then soak the spacer components into the warm water with mild soap for 15 minutes. Rinse the mask with warm water and move to air dry. Only the mask is rinsed with water in babyhaler because other parts get electric from the rinsing. Move other parts to air dry. Let them dry completely before reassembling to maintain its effectiveness and prevent contamination.</p>
<p>Scene 15: Closing words and Laurea's logo</p>	<p>A picture of Laurea's logo.</p> <p>Script & director: Jenna Piironen, Ingrid Roivas, and Pauliina Juvonen</p> <p>Nurse: Pauliina Juvonen</p> <p>Parent: Jenna Piironen</p> <p>Narrator: Ingrid Roivas</p> <p>Script & director: Jenna Piironen, Ingrid Roivas, and Pauliina Juvonen</p>		

Appendix 2: Invitation letter

Administration of inhaled asthma medication for children aged 1-3 years old: an educational video for nursing students

Dear final year degree nursing student,

We are implementing a functional thesis about administration of inhaled asthma medication for children aged 1-3 years old: an educational video for nursing students. Authors are collecting feedback from the educational video which we have produced as the part of the thesis.

The purpose of the thesis was to create an educational video in English that demonstrates the proper administration of inhaled asthma medication for nursing students. The aim of the thesis is to increase the skill of nursing students regarding inhaled asthma medication, the required equipment, and the administration of asthma medications for children aged 1-3 years old.

The survey contains 5 questions about the educational video. Answering the survey requires watching the educational video. The educational video is about 3-4 minutes long and answering to the survey takes approximately 2-3 minutes.

The answer options are:

1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

This feedback will evaluate the educational video on administering inhaled asthma medication for children aged 1-3 years old. The video is directed to the degree nursing students at Laurea. We would be grateful if you could give us an evaluation of the educational video.

The feedback is collected anonymously, and the answers are treated in confidence. Besides the researchers, no one outside has access to the collected data. No background information is collected from respondents. After the research, collected data is destroyed properly.

Giving feedback is completely voluntary. Answering the survey can be interrupted at any time and there are no consequences for non-participation or suspension of the survey. **You provide informed consent for the use of your survey responses in data analysis by responding to the survey.**

Thank you, if you have any further questions, you can contact us.