CARE IN PEDIATRIC ONCOLOGY

Care in Pediatric Oncology

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CONTENTS

Presentation

Cancer treatment is long. The support of the professionals and family is very important in a moment like this. This booklet on care in pediatric oncology has been made in language which is accessible to the population, especially the child's or the adolescent's caretaker. Besides, all the relevant care which need to be fixed has been illustrated to call attention to important aspects such as vaccines the patient can and cannot take, the importance of keeping the vaccination card up to date, Transportation of antineoplastics, care in splitting, hand hygiene, how to take a shower. As for nutrition, we highlight how the shopping must be done, if the caretaker can buy food in bulk, ingestion of honey and recipes that can be made at home in a fun way to the child.

Terms such as caretaker as a detective have been used to incorporate the caretaker as na actor in the care of the child when reading the labels in boxes, paying attention to the temperature in which the food is conserved, the Transportation home, the integrity of the wrappings, observing adverse effects in children, practical orientations for the home including showering, dish washing, flushing, and other daily cares.

The chapter about adverse effects of the excipients, although in an accessible language, is dedicated to professionals. The excipients must be inert in the medications, but they can also be toxic. There has been a description of these excipients according to their route of administration and pharmaceutical form, so the professional can read which excipients in each medication he/she is going to prescribe and take precautions as for events such as allergies, activation of sexual hormones in children, and so toxicities by incapacity of metabolizing medications do not occur.

Nursing care was divided into the professional and patient aspects. The professional aspect includes additional relevant information from explanatory leaflets that can be used at nursing stations. Home nursing care focuses mainly on administering medications through feeding tubes.

Another highlighted chapter is about tablet splitting, which includes tables that guide the correct splitting of antineoplastic drugs to prevent home contamination.

The mother and child become active participants in cancer treatment, rather than mere spectators. They can identify and promptly report adverse events, helping to prevent complications arising from chemotherapy. The aim of the care is to provide guidance and prevent these events from occurring by communicating in a simple and cheerful way to encourage family cooperation. Combined with the efforts of the healthcare team, this collaboration works towards a happy outcome. This guide, by providing knowledge, enhances family safety, empowering them with the means to optimize their fight and, consequently, achieve victory. Everything was done with great care, with the help of a multidisciplinary team

composed of nutritionists, pharmacists, doctors, dentists, and nurses who work in the treatment of children with cancer.

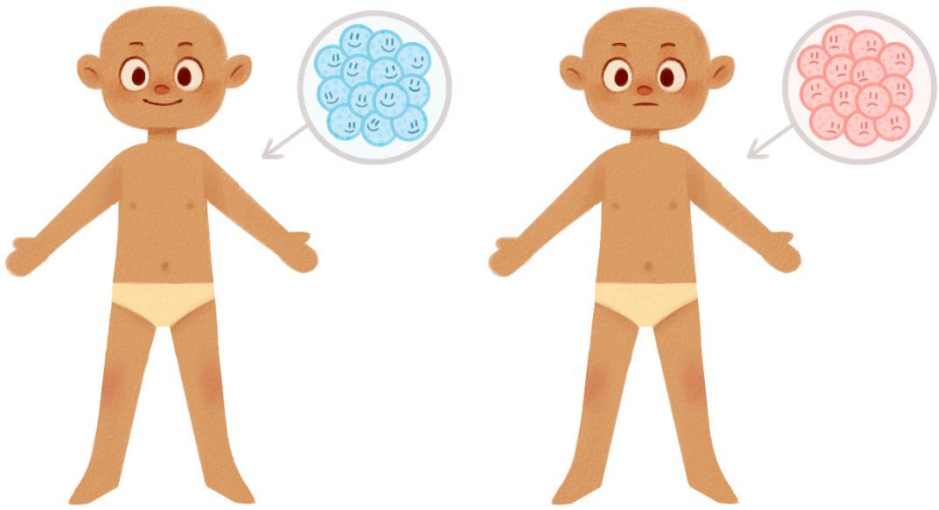
The guide supports cancer treatment in children and takes the reader on a journey through various chapters. The care guidelines include nutrition, dentistry, nursing, tablet splitting, excipients, medication storage, hand hygiene, medication disposal, and vaccines. We made the technical terms as accessible as possible, with playful illustrations, to make this journey as interesting as possible. We hope you enjoy it.

Patricia Medeiros de Souza

Family Care

Natália Lopes de Freitas
Raquel Alves Toscano

Cancer means that, at some point, the cell factory started having problems and began to make cells in a different size. Some are leaving the factory unready, thus causing an unbalance in the body of the child/teenager Park et al., 2020; Uthamacumaran, 2020). Therefore, there is need for treatment, so everything goes back to normal. The most common cancer in children/teenagers is in the blood, although it can happen in other parts (Miller et al., 2020).



Cancer is not the guardian's/caregivers' fault, the result of medication, falling at home, spoiled food, or something the guardians/caregivers have or have not done (The cause of cancer, 2021; Wong et al., 2020). Also, cancer is not contagious: the child/teenager will not pass on the disease to anybody (Park et al., 2020; Uthamacumaran, 2020).

The child/teenager should be informed about what is going on in their body, the necessary procedures and treatment so their cells work again harmoniously, and that sometimes can be long and painful; but they will count on the support of Family and friends (Rodgers et al., 2016; Long, Marsland, 2011; Woodgate, 2006).

The health professionals will use resources such as toys to help detect any problem, clearing any doubt during this period in which the child/teenager is being submitted to

numerous procedures (Jenholt Nolbris, Ahlström, 2014; Prchal, Landolt, 2012; Long, Marsland, 2011).

The World Health Organization (WHO, 2021, 2008) has launched the third global challenge of patient safety, which aims at the participation of the guardian/caregiver in the treatment of the child/teenager. The guardian/caregiver will work as an agent, helping with the treatment, reducing hospital stay by controlling the risks of side effects, thus avoiding the occurrence of errors related to medications, and collaborating on the success of the treatment (Sheikh et al., 2017; WHO, 2017).

The guardian's/caregiver's commitment also includes care in the home with bed linen used by the child/teenager, keeping other people from being contaminated by chemotherapeutic, advising on how to wash the dishes, flush the toilet and partition pills for cancer treatment (WHO, 2021, 2017, 2008; Sheikh et al., 2017).

The guardian/caregiver takes on the role of "home sheriff", identifying possible bad effects that can be avoided and by guiding the rest of the family so the treatment is safe and successful to all (Institute of Medicine, 2000).

1 CÂNCER WHAT IS THE TREATMENT LIKE FOR A CHILD/TEENAGER WITH CANCER

The medications for cancer treatment may be most commonly administered through the mouth (orally), under the skin (subcutaneous), in the muscle (intramuscularly) or a vein (intravenous) (Kahn et al., 2017). These medications are called chemotherapeutic, which mix into the blood and travel through the whole body, destroying the bad cells and avoiding the multiplication of defective cells (Urtasun Erburu et al., 2020).

Chemotherapeutic drugs do not cause pain, but the child/teenager may feel the needlestick and, sometimes, uncomfortable sensations such as tiredness (fatigue), burning, itching, rashes, nausea, hair loss, constipation or diarrhea, mouth sores (mucositis), reduced or increased appetite, yellow or red eye, change in the color of pee and poop (red or dark). The child/teenager should be able to trust their guardian/caregivers and, if something happens that they don't think is good, they should inform their doctors (Instituto Nacional do Câncer - INCA, 2022).

The child/teenager does not necessarily show bad effects. The effects depend on each child/teenager and that does not mean the medication did not work or that the patient is not responding to the treatment (INCA, 2022).

The medications should be taken as prescribed by the doctor and at the right times What to do if the patient forgets to take them, if they can or cannot be taken on a full stomach, which other medications can or cannot be taken at the same time should be oriented by the pharmacist, optimizing the treatment (Andrade, 2009). The guardian/caregiver should inform if they use anything at home not prescribed by the doctor, including natural products once they can also cause effects that are not desirable (Garcia-Cortes et al., 2020).

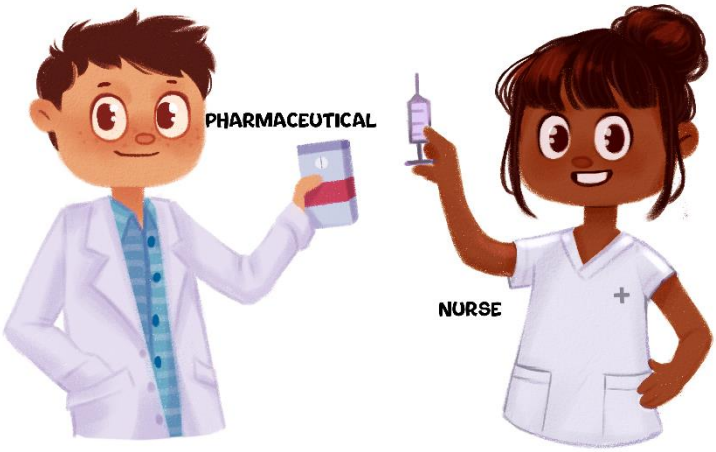
Besides, the guardian/caregiver should also be informed about all the medications the child/teenager has used during the treatment for this data are very important to retrieve any information in a doctor's visit or any other place where the child/teenager is treated, during hospitalization, so the conduct taken is as accurate as possible (Hosoi et al., 2020; Lopes et al., 2000). Information is key in the accuracy of the conducts that should be taken.

The doctor talks, explains and guides the child/teenager and their guardians/caregivers for better understanding and choice of the best treatment, thus increasing adhesion to drug therapy (von Mackensen et al., 2020; Gönderen Çakmak, Uncu, 2020). Seek to increase the

commitment of family to treatment and improve relationships with health professionals (Partanen et al., 2018; Silva, Lima, 2014; Ekstedt et al., 2014).

We have said that the medication for cancer treatment can be taken through the mouth or a vein, but there are other forms of treating cancer, which include a machine that sends rays through the body of the child/teenager (radiotherapy); and/or the doctor might find a surgical procedure necessary to remove the tumor; or a transplant (bone marrow) can be carried on to exchange sick cells for healthy cells (Ministério da Saúde (BR), 2014).

Remember to tell your multiprofessional team about all the medications the child/teenager has been taking for cancer treatment as well as those for domestic use, including natural remedies (phytotherapeutic drugs) and teas (Schümann, Solomons, 2017; Nicoletti et al., 2007). The pharmacist will analyze the occurrence of drug interactions which can interfere in the quantity of chemotherapeutic drugs, decreasing or increasing toxicity (Garcia-Cortes et al., 2020; Schümann, Solomons, 2017; Nicoletti et al., 2007).

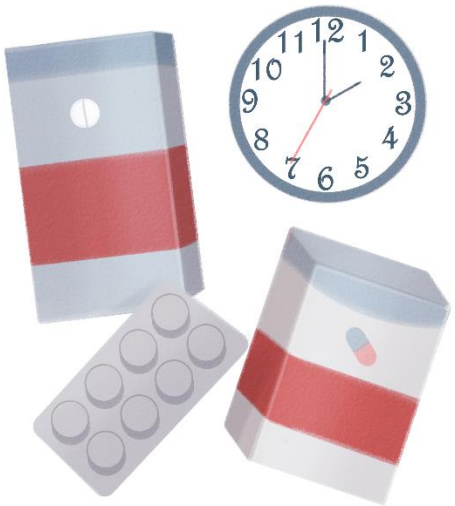


There is a myth that plants do no harm, but that is a lie (Schümann, Solomons, 2017). There are plants which can cause liver damage such as plants to treat anxiety (Kawa-kawa (Garakani et al., 2021) and St. John's Wort (Tokgöz, Altan, 2020)), natural products such as Herbalife® (Grigoletto et al., 2016; Zambrone et al., 2015) and Forever® (Gonçalves, 2008), which apparently originate from herbs and cannot do any harm. Keep health professionals informed of everything (Roy, 2021; Garcia-Cortes et al., 2020; Schümann, Solomons, 2017).

2 OTHER MEDICATIONS THAT THE CHILD/TEENAGER CAN TAKE

The treatment is individualized. It means that the medication for a child's/teenager's cancer treatment is not the same for another one. The health team is very careful so that the medication takes the expected effect without harming the patient's body too much. Therefore, when you visit the doctor, remember to take a box with all the medications the child/teenager might need to take and that are available at home so it is possible to ask if they

are safe for the child's/teenager's current situation. In the box, Include herbs used for any kind of diseases (Brito et al., 2021; Rodrigo Rincón et al., 2021; Li et al., 2019; Teles et al., 2017; Caccialanza et al., 2016; Poltronieri, Tusset, 2016; Moreira, 2016; Kuritzky, Beecker, 2015; Instituto Desiderata, 2015; Leite et al., 2015; Baracos, Kazemi-Bajestani, 2013; Ministério da Saúde (BR), 2013; Mesna, 2013; INCA, 2016, 2013a, 2013b; Reed et al., 2012; Haidar, Jeha, 2011; Bruining et al., 2011; Barbosa et al., 2010; Gonzáles et al., 2009; Medeiros-Souza et al., 2007; Otero López, 2003; Lopes et al., 2000; Taketomo et al., 1992; Bozzetti et al., 1982) as well as medications for common diseases such as the flu, sore throat.



The child/teenager is not a little adult (Mello, 2004). The child's/teenager's body is in development (Bartelink et al., 2006; Kearns et al., 2003). Thus, when they are born there is more water than fat in their bodies, the medications that can go to the brain boost their penetration, increasing side effects because the barrier is not yet formed (Silva, 2006; Simons, Tibboel, 2006). Besides, after the child/teenager takes the medication, it should be eliminated. There are elements in the liver that break this medication into smaller pieces so the body can send it out through pee or poop (Yang et al., 2009; Bartelink et al., 2006; Mello, 2004; Kearns et al., 2003; Johnson, 2003; Alcorn, McNamara, 2003).

Additionally, there are many other characteristics that should be taken into considerations when it regards the concentration of the chemotherapeutic drug in the child's body, which includes the distribution of water and fat (Katzung, 2005; Alcorn, McNamara, 2003; Labaune, 1993), amount of protein in the blood (Kearns et al., 2003), stomach and bowel movements (Katzung, 2005; Fuchs, 2004; Kearns et al., 2003; Alcorn, McNamara, 2003), amount of blood in the muscles (Bartelink et al., 2006) and the development of some organs (Partanen et al., 2018; Piñeiro-Carrero, Piñeiro, 2004). See how difficult it is to decide on a medication for a child/teenager? (WHO, 2007).

Another aspect we should pay attention to is in relation to other components of the medication called excipients. I will explain: if you eat a chocolate cake, you are interested in the chocolate, but there is also sugar, yeast, eggs that help make the cake. These other components of the cake are called excipients of the medication. Actually, they are components that must be in the medication, but they have no function in treating any symptom, but as the child's/teenager's body is in development, they can have difficulty eliminating the medication, which stays longer in the body causing toxicity (Balbani et al., 2006; European Medicines Agency, 2006; Peres et al., 2005; Heineck et al., 2004; Pifferi, Restani, 2003; Rowe et al., 2000; Napke, Stevens, 1984).

When you get the medication in the hospital for the child's/teenager's cancer treatment, write in a piece of paper the other components, take it to the pharmacist and ask them if it is adequate to the age group, weight, and other health problems the child/teenager has.

3 CARE THAT SHOULD BE TAKEN OF A CHILD/TEENAGER WITH CANCER

3.1 Body Hygiene

Taking care of hygiene is important to everyone. But in the case of the child/teenager that is undergoing cancer treatment, it is even more important because the child/teenager's system that protects them against bacteria, viruses, and Worms (immune system) is weak. Therefore, lack of the child's/teenager's hygiene may cause various infections and hinder the treatment (Rodrigo Rincón *et al*., 2021; Teles *et al*., 2017; Barbosa *et al*., 2010).

Cares the guardian or caregiver must pay attention to (Rodrigo Rincón *et al*., 2021; Brito *et al*., 2021; Teles *et al*., 2017; Instituto Desiderata, 2015; Mesna, 2013; INCA, 2013a;

Bruining *et al*., 2011; Barbosa *et al*., 2010; González *et al*., 2009; Medeiros-Souza *et al*., 2007; Otero López, 2003; Takemoto *et al*., 1992):

- Wear a mask if the doctor asks to;
- Use unscented hygiene products (soap, shampoo, conditioner, combing cream, moisturizer) without perfume;
- For intimate hygiene, use soft toilet paper, when possible, after pooping, perform personal hygiene with soap and water to avoid hurting the area;
- Always wash and dry hands after meals, before and after going to the toilet;
- Trim and clean nails;
- Always brush teeth after meals using a soft-bristle toothbrush, if possible;
- Wash hands first, face and head after, and then belly, back, arms and catheter (if you have one).

3.2 Hygiene of the home

The home is an environment full of contaminants, and because there are other people in contact with the child/teenager, there is risk of other residents transmit diseases (Rodrigo Rincón et al., 2021; Teles et al., 2017; Barbosa et al., 2010).

Cares the guardian or caregiver must pay attention to (Rodrigo Rincón et al., 2021; Brito et al., 2021; Teles et al., 2017; Instituto Desiderata, 2015; Mesna, 2013; INCA, 2013a; Bruining et al., 2011; González et al., 2009; Medeiros-Souza et al., 2007; Otero López, 2003; Takemoto et al., 1992):

- keep the house clean and ventilated;

- keep toys clean washing them frequently, if possible;
- keep carpets and curtains clean;
- discard medications for cancer at the pharmacy in the Hospital or Clinic where treatment is received because they will be treated in an appropriate place (incinerated). The medications which are not for cancer treatment can be discarded at a basic health unit (BHU), collection point or drugstore closer to your home. If there is need for discarding syringes and needles, take them in PET bottles to avoid accidents;

- should the child/teenager use the toilet, flush three times with the toilet lid down on chemotherapy days;

- cleaning of the room should be done with bleach, and everything must be disposed in two tightly-closed plastic bags;

- **sanitize the kitchen sponge daily, including the sponge used to clean the knife used to partition the pills. This sponge should be used exclusively to sanitize this knife or utensil used to cut (partition) the pills**.
  - Tip 1: Wash the sponge and wring it out to remove as much water as possible (Dória, 2015). After that, let it soak in a recipient full of boiling water for three minutes (Saiba [...], 2019).
  - Tip 2: Mix two tablespoons of bleach with 1 liter of water and leave the sponge submerged in the solution for about 15 minutes (Saiba [...], 2019).

3.3 Pets

Pets are great company for children/teenagers and can emotionally help the child/teenager who is undergoing cancer diagnosis and cancer treatment (INCA, 2016). The guardians and caregivers should observe vaccination, nails, fur and pet hygiene to mitigate the risk of disease transmission and contamination (Moreira et al., 2016; Reed et al., 2012).

Besides, it is not a good idea to touch street animals or animals whose guardians did not knowingly take these precautions, and do not have any contact with wild animals because there is risk that the child catches a disease since the system that protects the body of the child/teenager is weak (Moreira et al., 2016; Reed et al., 2012).

3.4 Make-up

It is very important for the child's/teenager's mental health to maintain their self-care, empowerment, and self-esteem. This way, as long as the make-up is hypoallergenic and does not have methylparaben or propylparaben for these components may alter the child's/teenager's development. But it is very important to read the labels and inform the doctor about makeup use (Leite et al., 2015; INCA, 2013b; Bergman et al., 2013; Final amended [...], 2008).

3.5 Sun protection

All children/teenagers must use sunscreen to prevent diseases caused by excessive solar exposure such as skin cancer, early aging, skin patches, amongst other functions (Li et

al., 2019; Kuritzky, Beecker, 2015). Children/teenagers undergoing cancer treatment should be even more careful because some medications used may cause darkening of the skin When exposed to sunlight, especially on the knee, elbow, and nails (Brito et al., 2021; Cuidados [...], 2021; Instituto Desiderata, 2015; INCA, 2013a).

Thus, the guardians and caregivers must apply sunscreen of SPF 30, at least, on the body parts exposed to the sun or use a black umbrella for the child/teenager to block the sun, wear a hat or a cap as a form of protection, keep the skin hydrated with moisturizer, and avoid exposure to the sun between 10 a.m. and 4 p.m., when the sunlight is stronger (Brito et al., 2021; Cuidados [...], 2021; Instituto Desiderata, 2015; INCA, 2013a).

Therefore, children/teenagers undergoing treatment can go to the beach or the pool, but first they should tell the doctor so they can be advised on the best time to do this and the precautions to be taken. However, they should be protected and use a lot of sunscreen. If, have a fully or semi-implanted catheter, you should avoid bathing in swimming pools, beaches or public bathrooms because of the chance of contamination of the catheter, having to change it (Brito et al., 2021; Cuidados [...], 2021; Instituto Desiderata, 2015; INCA, 2013a).

3.6 Food

Food is a great way to care for the intestine and is extremely important to keep the body healthy because it has all the nutrients needed for the development of the child/teenager (Bozzetti et al., 1982).

Remember to follow the guidance provided by the nutrition team, which takes care of the child/teenager, as many foods need to be carefully sanitized and should be avoided

depending on the stage of treatment (Caccialanza et al., 2016; Poltronieri, Tusset, 2016; Baracos, Kazemi-Bajestani, 2013; Ministério da Saúde (BR), INCA, 2013).

3.7 Wounds in the mouth (mucositis)

Wounds in the mouth and throat are very common in the treatment for cancer and can go down to the child's/teenager's intestine in some situations. The wounds look like mouth ulcers, which can be painful and hinder mastication and deglutition of food (Daugėlaitė et al., 2019; He et al., 2018).

Therefore, guardians and caregivers must look every day for wounds in the mouth, and the children/teenagers must brush their teeth with a soft-bristle toothbrush, non-abrasive toothpaste for children; avoid alcoholic beverages, smoking, too much salt in the food and have preference for soft foods until the improvement of the wounds (Ward et al., 2015; Bruining et al., 2011; Barbosa et al., 2010; González et al., 2009).

Keep the multiprofessional team informed because a treatment with laser in the mouth (laser therapy) or drugs to improve the wounds and, consequently, the discomfort caused by them (Daugėlaitė et al., 2019; Hong et al., 2019; He et al., 2018; Carneiro-Neto et al., 2017; Ward et al., 2015).

3.8 Anemia, leukopenia and thrombocytopenia

A quimioterapia que é usada para tratar o câncer não funciona só nas células ruins, ela acaba The chemotherapy used to treat cancer does not work only on the bad cells; it also destroys, unintentionally, some good cells such as those of the blood which transports oxygen (red blood cells), immune system cells that defend the body (white blood cells), and cells that keep us from bleeding too much (platelets). Consequently, the child/teenager will take many blood tests during treatment (Schümann, Solomons, 2017; Knight et al., 2004).

If any of those cells' quantity is low, the child/teenager may have symptoms such as fatigue, shortness of breath, paleness, red dots on the skin, purple and red skin patches, and bleeding (Varlotto, Stevenson, 2005; Knight et al., 2004).

Therefore, guardians and caregivers must keep an eye on these symptoms and take precaution (Brito et al., 2021; Teles et al., 2017; Schümann, Solomons, 2017; Instituto Desiderata, 2015; INCA, 2013a; Medeiros-Souza et al., 2007; Varlotto, Stevenson, 2005; Knight et al., 2004; Otero López, 2003):

- check the skin, mouth, ear, and nose looking for wounds, purple and red patches, red spots, or bleeding;

- remind the child/teenager to brush their teeth using a soft-bridle toothbrush, preferably with toothpaste for children, rinse the toothbrush after using it, and keep it in a different box away from other toothbrushes;
- protect the skin against cuts, especially after waxing or shaving;
- always trim the nails, to avoid possible scratches;
- do not pop pimples;
- always take the temperature if you notice any alteration;
- increase the intake of food of animal origin (beef, chicken, fish), and dark green vegetables (kale, broccoli, spinach, beans, pea) with food that are source of vitamin c (orange, tangerine, lime, acerola);
- avoid milk, cheese, cream cheese, yogurt, and other dairy products near lunchtime or dinner because these foods can "steal" some essential nutrients.

3.9 Vaccines

Vaccines are very important in the formation of the system that protects the child's/teenager's body, so when they become adults, they will be protected against the main diseases. However, children/teenagers undergoing cancer treatment should be careful as to how the vaccine is produced (WHO, 2021; Fundação Oswaldo Cruz - Fiocruz, 2016; Ministério da Saúde (BR), 2015; Toscano, Kosim, 2003).

There are vaccines made from live microorganisms, from dead or inactive components, attenuated viruses, and from genetic material. Thus, while the child/teenager is taking the medication, their defense is lower (reduced immunity), not only might the vaccine not be able to protect them, but it can also cause them other bad effects such as a mild form of the disease or other types of infection (WHO, 2021; Fiocruz, 2016; Toscano, Kosim, 2003).

With that in mind, it is important that the guardian or caregiver inform the doctor which vaccine the child/teenager needs to take, taking the vaccine card into consideration. The doctor will then check if the patient can take that vaccine available at the healthcare facility or if they will have to resort to another kind of vaccine. Besides, it should be verified if their siblings or other children/teenagers in the house can take the missing vaccine (WHO, 2021; Fiocruz, 2016; Ministério da Saúde (BR), 2015; Toscano, Kosim, 2003).

Examples of types of vaccine:

- live microorganisms: COVID-19 (WHO, 2022; Ministério da Saúde (BR), 2021); Human Papillomavirus (HPV) (Zardo et al., 2014);
- compounds or dead/inactive parts: COVID-19 (WHO, 2022; Ministério da Saúde (BR), 2021); Diphtheria and Tetanus (Double Adult – dT) (Ministério da Saúde (BR), 2021); Flu (Influenza) (Ministério da Saúde (BR), 2021); Pneumococcal (Pneumo 10,

Pneumo 23) (Ministério da Saúde, 2021); Polio or Infantile Paralysis (IPV) (Ministério da Saúde (BR), 2015); Diphtheria, Tetanus and Pertussis (dTpa) (Ministério da Saúde, 2015); Meningococcal C (Ministério da Saúde, 2015); Hepatitis A (Ministério da Saúde (BR), 2015);

- attenuated virus: COVID-19 (WHO, 2022; Ministério da Saúde (BR), 2021); Polio or Infantile Paralysis (OPV) (Ministério da Saúde (BR), 2021) – in drops (oral); Measles, Rubella e Mumps (MMR) (Ministério da Saúde (BR), 2021); Hepatitis B (Ministério da Saúde (BR), 2021); Yellow Fever (Ministério da Saúde (BR), 2021); Measles and Rubella (MR) (Ministério da Saúde (BR), 2021); Human Rotavirus (HROV) (Ministério da Saúde (BR), 2015); Measles, Mumps, Rubella and Chickenpox (MMRV) (Ministério da Saúde (BR), 2015);
- attenuated bacteria: Pertussis (BCG) (Ministério da Saúde (BR), 2021); Diphtheria, Tetanus, Whooping Cough and Meningitis caused by Haemopilhus (Tetravalent) (Ministério da Saúde (BR), 2021);
- Attenuated bacteria and vírus: Diphtheria, Tetanus and Pertussis, Haemophilus influenzae B Hepatitis B - Pentavalent (DTPa-IPV/Hib) (Ministério da Saúde (BR), 2015);
- genetic material: COVID-19 (WHO, 2022).

4 DAILY ACTIVITIES

Cancer does not deprive the child/teenager of being in contact with their friends. However, in the beginning of the treatment, the child/teenager may be weaker so leisure time should be restricted until the body is stronger.

Hence, it is necessary to take precaution, so the child/teenager feels well, being the action of the guardians or caregivers extremely necessary to help with these precautions

Here are some guidelines and cares you should avoid as much as possible:

- Avoid getting in contact with people who have any infectious diseases such as chicken pox, the flu, COVID-19 (Brito et al., 2021; Instituto Desiderata, 2015; INCA, 2013a; Cataneo et al., 2011);
- Avoid activities that increase the risk of trauma or falls due to changes that occur in the blood secondary to treatment (Brito et al., 2021; Freguglia, Tolocka, 2018; Castro Filha et al., 2016; Instituto Desiderata, 2015; INCA, 2013a; Dias et al., 2013; Kinsella et al., 2006);
- Avoid too many visits, with different pepleo (Brito et al., 2021; Instituto Desiderata, 2015; INCA, 2013a; Cataneo et al., 2011);
- Avoid crowded places during treatment. If you want to go to the movies or the theater, go to sessions that are emptier (Instituto Desiderata, 2015; Brito et al., 2021; Freguglia, Tolocka, 2018; Castro Filha et al., 2016; INCA, 2013a; Dias et al., 2013; Cataneo et al., 2011; Kinsella et al., 2006);
- Avoid animals which you do not know if they are up to date with their vaccines (Brito et al., 2021; Instituto Desiderata, 2015; INCA, 2013a);
- In the beginning of the treatment, avoid going to school, but the school and the teacher must be asked to send school activities to the carried out at home until a return to in-person activities can occur (Brito et al., 2021; Instituto Desiderata, 2015; INCA, 2013a; Rolim, Góes, 2009; Brasil, 1990);
- Sport and light physical activities should be continued and stimulated, though it should be reduced or interrupted so the system that protects the child's/teenager's body (immune system) is fully recovered (Brito et al., 2021; Freguglia, Tolocka, 2018; Castro Filha et al., 2016; Instituto Desiderata, 2015; INCA, 2013a; Dias et al., 2013; Kinsella et al., 2006).

Guardians and caregivers, we need your help so the cancer treatment is safe so the child/teenager can go back to play normally, such as playing football, run on the street and fly their kites as soon as possible.

When does the child/teenager undergoing cancer treatment should be taken to hospital (Brito et al., 2021; Instituto Desiderata, 2015; INCA, 2013a):

- Fever (equal or superior to 37.8ºC);
- Spots, red patches or dark patches on the skin (ecchymosis);
- Persistent bleeding;
- Paleness;
- Tiredness at little effort;
- Shortness of breath;
- Pain or difficulty going to the toilet for pee and/or poop;
- Stomachache of diarrhea;
- Vomiting;
- Persistent pain;
- Vision alteration;
- Change in behavior;
- Contact with people with infectious diseases such as chicken pox, COVID-19.

5 PREPARING FOR PALLIATIVE CARE

Even with the progression in the diagnosis and the cancer treatment, in some cases the doctors can no longer cure the child's/teenager's disease (Parra Sanches et al., 2014). When this moment arrives, the process of palliative care begins, which, according to the WHO, it is the action of actively and totally catering for the child/teenager, in their biopsychosocial and spiritual dimensions since the beginning of the diagnosis, relieving physical, psychological, social, and spiritual suffering, as well as providing family (Parra Sanches et al., 2014; Misko, 2012; Murray et al., 2010; Reis et al., 2009; WHO, 1998).

Religiosity is a way to intensify social support, allowing for better psychological adaptation of the guardians or caregivers, reducing depressive feelings by comforting, supporting for better acceptance of the situation, overcoming obstacles, and dealing with the disease (Parra Sanches et al., 2014; Silva, Acker, 2007).

Hence, there is an approach of attention to health, focusing on quality of life and death (Parra Sanches et al., 2014). Remember that this process is intensely experienced by the guardians or caregivers, with many feelings because after the diagnosis there is a drastic change in all the family structure (Parra Sanches et al., 2014; Silva et al., 2009).

REFERENCES

Alcorn J, McNamara PJ. Pharmacokinetics in the newborn. Adv Drug Deliv Rev. 2003 Apr 29;55(5):667-86. doi: 10.1016/s0169-409x(03)00030-9

Andrade CC. Farmacêutico em oncologia: interfaces administrativas e clínicas. Pharmacia Brasileira [Internet]. 2009 mar./abr. [cited 2021 set. 21];1-24. Available from: https://www.cff.org.br/sistemas/geral/revista/pdf/70/encarte_pb70.pdf

Balbani APS, Stelzer LB, Montovani JC. Excipientes de medicamentos e as informações da bula. Rev Bras Otorrinolaringol. 2006;72(3):400-406. https://doi.org/10.1590/S0034-72992006000300018

Baracos V, Kazemi-Bajestani SM. Clinical outcomes related to muscle mass in humans with cancer and catabolic illnesses. Int J Biochem Cell Biol. 2013 Oct;45(10):2302-8. doi: 10.1016/j.biocel.2013.06.016

Barbosa AM, Ribeiro DM Caldo-Teixeira AS. Conhecimentos e práticas em saúde bucal com crianças hospitalizadas com câncer. Ciênc Saúde Coletiva. 2010;15 (suppl 1);1113-1122. https://doi.org/10.1590/S1413-81232010000700019

Bartelink IH, Rademaker CM, Schobben AF, van den Anker JN. Guidelines on paediatric dosing on the basis of developmental physiology and pharmacokinetic considerations. Clin Pharmacokinet. 2006;45(11):1077-97. doi: 10.2165/00003088-200645110-00003

Bergman A, Heindel JJ, Jobling S, Kidd KA, Zoeller T, editors. State of the science of endocrine disrupting chemicals - 2012. Geneva: World Health Organization; 2013.

Bozzetti F, Migliavacca S, Scotti A, Bonalumi MG, Scarpa D, Baticci F, *et al*. Impact of cancer, type, site, stage and treatment on the nutritional status of patients. Ann Surg. 1982 Aug;196(2):170-9. doi: 10.1097/00000658-198208000-00009

Brasil. Lei nº 8.069, de 13 de julho de 1990. Dispõe sobre o Estatuto da Criança e do Adolescente e dá outras providências. Diário Oficial da União [Internet]. 1990 set. 27 [. Available from: http://www.planalto.gov.br/ccivil_03/leis/l8069.htm

Brito AC, Oliveira BM, Chagas GM, Trivelato MFGO, Babeto LT, Viana MB. Orientações para o cuidado de crianças com câncer [Internet]. Belo Horizonte: Departamento de Pediatria, Faculdade de Medicina da UFMG; 2021 [cited 2021 ago. 10]. Available from: https://ftp.medicina.ufmg.br/observaped/cartilhas/cartilha-criancas-com-cancer.pdf

Bruining DM, van Roon EN, Graaf H, Hoogendoorn M. Cyclophosphamide-induced symptomatic hyponatraemia. Neth J Med. 2011 Apr;69(4):192-5.

Caccialanza R, Pedrazzoli P, Cereda E, Gavazzi C, Pinto C, Paccagnella A, *et al*. Nutritional support in cancer patients: a position paper from the Italian Society of Medical Oncology (AIOM) and the Italian Society of Artificial Nutrition and Metabolism (SINPE). J Cancer. 2016 Jan 1;7(2):131-5. doi: 10.7150/jca.13818

Carneiro-Neto JN, de-Menezes JD, Moura LB, Massucato EM, de-Andrade CR. Protocols for management of oral complications of chemotherapy and/or radiotherapy for oral cancer: Systematic review and meta-analysis current. Med Oral Patol Oral Cir Bucal. 2017 Jan 1;22(1):e15-e23. doi: 10.4317/medoral.21314

Castro Filha JGL, Miranda AKP, Martins Júnior FF, Costa HA, Figueiredo KRFV, Oliveira Junior MNS, *et al*. Influências do exercício físico na qualidade de vida em dois grupos de pacientes com câncer de mama. Rev Bras Ciênc Esporte. 2016;38(2):107-114. https://doi.org/10.1016/j.rbce.2015.11.008

Cataneo C, Canini SRMS, Castro PTO, Hayashida M, Gir E. Evaluation of the sensitivity and specificity of criteria for isolation of patients admitted to a specialized cancer hospital. Rev Latino-Am Enfermagem. 2011;19(5):1072-1079. https://doi.org/10.1590/S0104-11692011000500003

Cuidados com a pele no verão para quem tem câncer. Revista Abrale On-line. [Internet]. 2021 jul. 28 [cited 2021 set. 20]. Available from: https://revista.abrale.org.br/cuidados-com-a-pele-no-verao/

Daugėlaitė G, Užkuraitytė K, Jagelavičienė E, Filipauskas A. Prevention and Treatment of Chemotherapy and Radiotherapy Induced Oral Mucositis. Medicina (Kaunas). 2019 Jan 22;55(2):25. doi: 10.3390/medicina55020025

Dias JJ, Silva APC, Freire RLS, Andrade ASA. A experiência de crianças com câncer no processo de hospitalização e no brincar. REME Rev Min Enferm. 2013;17(3):608-619. http://dx.doi.org/10.5935/1415-2762.20130045

Dória L. Esponja de pia oferece risco à saúde? [Internet]. iSaúde, 2015 ago. 27 [cited 2022 jul. 10]. Available from: https://www.isaude.com.br/noticias/detalhe/noticia/esponja-de-pia-oferece-risco-a-saude/

Ekstedt M, Stenberg U, Olsson M, Ruland CM. Health care professionals' perspectives of the experiences of family caregivers during in-patient cancer care. J Fam Nurs. 2014 Nov;20(4):462-86. doi: 10.1177/1074840714556179

European Medicines Agency. Committee for Medicinal Products for Human use. Reflection paper: formulations of choice for the paediatric population [Internet]. London: European Medicines Agency; 2006 July 28 [cited 2022 set. 7]. Available from: https://www.ema.europa.eu/en/documents/scientific-guideline/reflection-paper-formulations-choice-paediatric-population_en.pdf

Final amended report on the safety assessment of Methylparaben, Ethylparaben, Propylparaben, Isopropylparaben, Butylparaben, Isobutylparaben, and Benzylparaben as used in cosmetic products. Int J Toxicol. 2008;27 Suppl 4:1-82. doi: 10.1080/10915810802548359

Freguglia IO, Tolocka RE. Atividade física e tratamento de câncer em crianças. Rev Med Minas Gerais. 2018;28:e-1964. http://dx.doi.org/10.5935/2238-3182.20180053

Fuchs FD. Farmacocinética clínica. In: Fuchs FD, Wannmacher L, Ferreira MBC, editores. Farmacologia clínica: fundamentos da terapêutica racional. Farmacologia clínica: fundamentos da terapêutica racional. 3. ed. Rio de Janeiro: Guanabara Koogan; 2004.

Fundação Oswaldo Cruz; Instituto de Tecnologia em Imunobiológicos Bio-Manguinhos. Vacinas: as origens, a importância e os novos debates sobre seu uso [Internet]. Rio de Janeiro, 25 jul. 2016 [cited 2021 Apr 8]. Available from: https://www.bio.fiocruz.br/index.php/br/noticias/1263-vacinas-as-origens-a-importancia-e-os-novos-debates-sobre-seu-uso?showall=1&limitstart=

Garakani A, Murrough JW, Freire RC, Thom RP, Larkin K, Buono FD, *et al*. Pharmacotherapy of anxiety disorders: current and emerging treatment options. Focus. 2021;19(2):222-242. DOI: 10.1176/appi.focus.19203

Garcia-Cortes M, Robles-Diaz M, Stephens C, Ortega-Alonso A, Lucena MI, Andrade RJ. Drug induced liver injury: an update. Arch Toxicol. 2020 Oct;94(10):3381-3407. doi: 10.1007/s00204-020-02885-1

Gonçalves VZ. Estudo de viabilidade técnica, econômica e financeira da extração e comercialização de um insumo farmacêutico a base de polissacarídeos de *Aloe barbadensis Miller* [dissertação na Internet]. Florianópolis: Centro Tecnológico, Departamento de Engenharia Química e Engenharia de Alimentos, Universidade Federal de Santa Catarina; 2008 [cited 2022 set. 7]. 115 p. Available from: https://repositorio.ufsc.br/xmlui/bitstream/handle/123456789/92050/262886.pdf?sequence=1&isAllowed=y

Gönderen Çakmak HS, Uncu D. Relationship between health literacy and medication adherence of turkish cancer patients receiving oral chemotherapy. Asia Pac J Oncol Nurs. 2020 Sep 14;7(4):365-369. doi: 10.4103/apjon.apjon_30_20

González LA, Pons-Estel GJ, Zhang JS, McGwin G Jr, Roseman J, Reveille JD, *et al*. Effect of age, menopause and cyclophosphamide use on damage accrual in systemic lupus erythematosus patients from LUMINA, a multiethnic US cohort (LUMINA LXIII). Lupus. 2009 Feb;18(2):184-6. doi: 10.1177/0961203308098988

Grigoletto A, Chromeck AB, Viana RAM, Genaro SC. Avaliação do consumo de produtos Herbalife® nos estudantes universitários em uma universidade de presidente prudente. Rev Saber Acad. 2016;21:10-24.

Haidar C, Jeha S. Drug interactions in childhood cancer. Lancet Oncol. 2011 Jan;12(1):92-9. doi: 10.1016/S1470-2045(10)70105-4

He M, Zhang B, Shen N, Wu N, Sun J. A systematic review and meta-analysis of the effect of low-level laser therapy (LLLT) on chemotherapy-induced oral mucositis in pediatric and young patients. Eur J Pediatr. 2018 Jan;177(1):7-17. doi: 10.1007/s00431-017-3043-4

Heineck I, Camargo AL, Ferreira MBC. Reações adversas a medicamentos. In: Fuchs FD, Wannmacher L, Ferreira MBC, editores. Farmacologia clínica: fundamentos da terapêutica racional. 3. ed. Rio de Janeiro: Guanabara Koogan; 2004. p. 73-85.

Hong CHL, Gueiros LA, Fulton JS, Cheng KKF, Kandwal A, Galiti D, *et al*. Systematic review of basic oral care for the management of oral mucositis in cancer patients and clinical practice guidelines. Support Care Cancer. 2019 Oct;27(10):3949-3967. doi: 10.1007/s00520-019-04848-4

Hosoi H, Nishikawa S, Kida Y, Kishi T, Murata S, Iwamoto M, Toyoda Y, Yamada Y, Ikeda T, Sonoki T. Susceptibility of patients receiving chemotherapy for haematological malignancies to scabies. J Hosp Infect. 2020 Nov;106(3):594-599. doi: 10.1016/j.jhin.2020.08.021

Institute of Medicine (US), Committee on Quality of Health Care in America. To err is human: building a safer health system. Kohn LT, Corrigan JM, Donaldson MS, editors. Washington (DC): National Academies Press (US); 2000.

Instituto Desiderata. Orientações para cuidadores de crianças e adolescentes com câncer [Internet]. Rio de Janeiro: Instituto Desiderata; 2015 [cited 2021 ago. 10]. Available from: https://desiderata.org.br/wp/wp-content/uploads/2018/12/cartilha_para_cuidadores.pdf

Instituto Nacional de Câncer José Alencar Gomes da Silva, Divisão de Comunicação Social. Quimioterapia: orientações aos pacientes [Internet]. 3. ed. Rio de Janeiro: INCA; 2013a [cited 2021 ago. 10]. Available from: https://www.inca.gov.br/sites/ufu.sti.inca.local/files//media/document//quimioterapia-2010.pdf

Instituto Nacional de Câncer José Alencar Gomes da Silva. Capa: Autoestima é fundamental [Internet]. Rede Câncer. 2013b abr. [cited 2021 maio 20];21:24-27. Available from: https://www.inca.gov.br/sites/ufu.sti.inca.local/files/media/document/capa-rede-cancer-21.pdf

Instituto Nacional de Câncer José Alencar Gomes da Silva. Terapia com cães reforça tratamento e ajuda na recuperação de pacientes de todas as idades [Internet]. Rede Câncer. 2016 jul. [cited 2021 set. 20];34:10-15. Available from: https://www.inca.gov.br/sites/ufu.sti.inca.local/files//media/document//rrc-34-capa-bom-pra-cachorro.pdf

Instituto Nacional do Câncer. Quais os efeitos colaterais da quimioterapia? [Internet]. [Rio de Janeiro], 2022 jun. 20 [cited 2023 maio 21]. Available from: https://www.gov.br/inca/pt-br/acesso-a-informacao/perguntas-frequentes/quimioterapia

Jenholt Nolbris M, Ahlström BH. Siblings of children with cancer - their experiences of participating in a person-centered support intervention combining education, learning and reflection: pre- and post-intervention interviews. Eur J Oncol Nurs. 2014 Jun;18(3):254-60. https://doi.org/10.1016/j.ejon.2014.01.002

Johnson TN. The development of drug metabolising enzymes and their influence on the susceptibility to adverse drug reactions in children. Toxicology. 2003 Oct 1;192(1):37-48. doi: 10.1016/s0300-483x(03)00249-x

Kahn JM, Athale UH, Clavell LA, Cole PD, Leclerc JM, Laverdiere C, *et al*. How variable is our delivery of information? Approaches to patient education about oral chemotherapy in the Pediatric Oncology Clinic. J Pediatr Health Care. 2017 Jan-Feb;31(1):e1-e6. doi: 10.1016/j.pedhc.2016.06.004

Katzung BG. Farmacologia básica e clínica. 9. ed. Rio de Janeiro: Guanabara Koogan; 2005.

Kearns GL, Abdel-Rahman SM, Alander SW, Blowey DL, Leeder JS, Kauffman RE. Developmental pharmacology--drug disposition, action, and therapy in infants and children. N Engl J Med. 2003 Sep 18;349(12):1157-67. doi: 10.1056/NEJMra035092

Kinsella E, Zeltzer P, Dignan T, Winter J, Breatnach F, Bouffet E. Safety of summer camp for children with chronic and/or life threatening illness. Eur J Oncol Nurs. 2006 Sep;10(4):304-10. doi: 10.1016/j.ejon.2005.12.009

Knight K, Wade S, Balducci L. Prevalence and outcomes of anemia in cancer: a systematic review of the literature. Am J Med. 2004 Apr 5;116 Suppl 7A:11S-26S. doi: 10.1016/j.amjmed.2003.12.008

Kuritzky LA, Beecker J. Sunscreens. CMAJ. 2015 Sep 22;187(13):E419. doi: 10.1503/cmaj.150258

Labaune JP. Farmacocinética. São Paulo: Andrei; 1993.

Leite MAC, Nogueira DA, Terra FS. Avaliação da autoestima em pacientes oncológicos submetidos ao tratamento quimioterápico. Rev Latino-Am Enfermagem. 2015;23(6):1082-9. DOI: 10.1590/0104-1169.0575.2652

Li H, Colantonio S, Dawson A, Lin X, Beecker J. Sunscreen application, safety, and sun protection: the evidence. J Cutan Med Surg. 2019 Jul/Aug;23(4):357-369. doi: 10.1177/1203475419856611

Long KA, Marsland AL. Family adjustment to childhood cancer: a systematic review. Clin Child Fam Psychol Rev. 2011 Mar;114(1):57-88. https://doi.org/10.1007/s10567-010-0082-z

Lopes LF, Camargo B, Bianchi A. Os efeitos tardios do tratamento do câncer infantil. Rev Assoc Med Bras. 2000;46(3):277-284. https://doi.org/10.1590/S0104-42302000000300014

Medeiros-Souza P, Santos-Neto LL, Kusano LT, Pereira MG. Diagnosis and control of polypharmacy in the elderly. Rev Saude Publica. 2007 Dec;41(6):1049-53. doi: 10.1590/s0034-89102006005000050

Mello ED. Prescrição de medicamentos em pediatria. In: Fuchs FD, Wannmacher L, Ferreira MBC, editores. Farmacologia clínica: fundamentos da terapêutica racional. 3. ed. Rio de Janeiro: Guanabara Koogan; 2004. p. 942-948.

Mesna. In: UpToDate Inc. [database on the Internet]. Waltham (MA); 2013 [cited 2014 jul. 01]. Available from: http://www.uptodate.com. Subscription required to view.

Miller KD, Fidler-Benaoudia M, Keegan TH, Hipp HS, Jemal A, Siegel RL. Cancer statistics for adolescents and young adults, 2020. CA Cancer J Clin. 2020 Nov;70(6):443-459. https://doi.org/10.3322/caac.21637

Ministério da Saúde (BR), Secretaria de Atenção à Saúde. Protocolos clínicos e diretrizes terapêuticas na oncologia [Internet]. Brasília: Ministério da Saúde; 2014 [cited 2023 maio 21]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/protocolos_clinicos_diretrizes_terapeuticas_oncologia.pdf

Ministério da Saúde (BR), Secretaria de Ciência, Tecnologia, Inovação e Insumos Estratégicos em Saúde, Departamento de Ciência e Tecnologia. Vacinas em desenvolvimento contra Covid-19: 12 de março de 2021. [recurso eletrônico]. Brasília: Ministério da Saúde; 2021 [cited 2023 Apr 20]. Available from: https://www.gov.br/saude/pt-br/coronavirus/vacinas/pdfs/20210312_cgpclin_decit_sctie_ms_vacinas_em_desenvolvimento_contra_covid-19-1.pdf

Ministério da Saúde (BR), Secretaria de Vigilância em Saúde. Programa Nacional de Imunização. Brasília; 2015.

Ministério da Saúde (BR); Instituto Nacional de Câncer José Alencar Gomes da Silva. Inquérito brasileiro de nutrição oncológica. Organização Cristiane Aline D'Almeida, Nivaldo Barroso de Pinho. Rio de Janeiro: INCA; 2013.

Misko MD. A experiência da família da criança/adolescente em cuidados paliativos: flutuando entre a esperança e a desesperança em um mundo transformado pelas perdas [doutorado]. São Paulo (SP): Escola de Enfermagem de Ribeirão Preto da USP; 2012.

Moreira RL, Gubert FA, Sabino LMM, Benevides JL, Tomé MABG, Martins MC, *et al*. Terapia assistida com cães em pediatria oncológica: percepção de pais e enfermeiros. Rev Bras Enferm. 2016;69(6):1188–94. https://doi.org/10.1590/0034-7167-2016-0243

Murray SA, Kendall M, Boyd K, Grant L, Highet G, Sheikh A. Archetypal trajectories of social, psychological, and spiritual wellbeing and distress in family caregivers of patients with lung cancer: secondary analysis of serial qualitative interviews. BMJ. 2010;304:c2581. https://doi.org/10.1136/bmj.c2581

Napke E, Stevens DG. Excipients and additives: hidden hazards in drug products and in product substitution. Can Med Assoc J. 1984 Dec 15;131(12):1449-52.

Nicoletti MA, Oliveira-Júnior MA, Bertasso CC, Caporossi PY, Tavares APL. Principais interações no uso de medicamentos fitoterápicos. Infarma. 2007;19(1/2):32-40.

Otero López MJ. Errores de medicación y gestión de riesgos. Rev Esp Salud Pública. 2003;77(5):527-40.

Park JH, Pyun WY, Park HW. Cancer metabolism: phenotype, signaling and therapeutic targets. Cells. 2020 Oct 16;9(10):2308. https://doi.org/10.3390/cells9102308

Parra Sanches MV, Nascimento LC, Lima RAG. Crianças e adolescentes com câncer em cuidados paliativos: experiência de familiares. Rev Bras Enferm. 2014;67(1):28-35. https://doi.org/10.5935/0034-7167.20140003

Partanen E, Lemetti T, Haavisto E. Participation of relatives in the care of cancer patients in hospital - a scoping review. Eur J Cancer Care (Engl). 2018; 27(2):e12821. https://doi.org/10.1111/ecc.12821

Peres KG, Oliveira CT, Peres MA, Raymundo MS, Fett R. Sugar content in liquid oral medicines for children. Rev Saude Publica. 2005 Jun;39(3):486-9. doi: 10.1590/s0034-89102005000300022

Pifferi G, Restani P. The safety of pharmaceutical excipients. Farmaco. 2003 Aug;58(8):541-50. doi: 10.1016/S0014-827X(03)00079-X

Piñeiro-Carrero VM, Piñeiro EO. Liver. Pediatrics. 2004 Apr;113(4 Suppl):1097-106.

Poltronieri TS, Tusset C. Impacto do tratamento do câncer sobre o estado nutricional de pacientes oncológicos: atualização da literatura. Rev Bras Ciênc Saúde. 2016;20(4): 327-332. 2016. DOI:10.4034/RBCS.2016.20.04.10

Prchal A, Landolt MA. How siblings of pediatric cancer patients experience the first time after diagnosis: a qualitative study. Cancer Nurs. 2012 Mar-Apr;35(2):133-40. doi: 10.1097/NCC.0b013e31821e0c59

Reed R, Ferrer L, Villegas N. Curadores naturais: uma revisão da terapia e atividades assistidas por animais como tratamento complementar de doenças crônicas. Rev Latino-Am Enfermagem. 2012;20(3):612-618. https://doi.org/10.1590/S0104-11692012000300025

Reis J, Dias SP, Mazzaia MC. A assistência da criança na atenção básica e sua relação com o diagnóstico tardio do câncer infantil. Rev Bras Ciênc Saúde. 2009;7(20):52-62. https://doi.org/10.13037/rbcs.vol7n20.320

Rodgers CC, Laing CM, Herring RA, Tena N, Leonardelli A, Hockenberry M, *et al*. Understanding effective delivery of patient and family education in pediatric oncology: a systematic review from the Children's Oncology Group. J Pediatr Oncol Nurs. 2016;33(6):432-446. https://doi.org/10.1177/104345421665

Rodrigo Rincón I, Irigoyen Aristorena I, Tirapu León B, Zaballos Barcala N, Sarobe Carricas M, Lobo Palanco J, *et al*. Patients and relatives as auditors of safe practices in oncology and hematology day hospitals. BMC Health Serv Res. 2021 Jan 7;21(1):31. doi: 10.1186/s12913-020-06018-3

Rolim CLA, Góes MCR. Crianças com câncer e o atendimento educacional nos ambientes hospitalar e escolar. Educ Pesqui. 2009;35(3):509-523. https://doi.org/10.1590/S1517-97022009000300007

Rowe RC, Sheskey PJ, Owen SC, editors. Handbook of pharmaceutical excipients. 3rd ed. Grayslake (IL): Pharmaceutical Press; 2000. p. 7-9, 38-413, 146-153, 340-344, 392-398, 454-459, 471-473, 485-486, 490-492, 515-518, 539-543.

Roy A. Plumbagin: a potential anti-cancer compound. Mini Rev Med Chem. 2021;21(6):731-737. doi: 10.2174/1389557520666201116144421

Saiba como manter a esponja da cozinha limpa em 5 passos [Internet]. Blog Condor, abril 4, 2019 [cited 2022 jul. 5]. Available from: https://condor.ind.br/blog/limpeza/saiba-como-manter-a-esponja-da-cozinha-limpa.html#:~:text=Depois%20de%20lavar%20a%20lou%C3%A7a,para%20deix%C3%A1%2Dla%20completamente%20seca.&text=Para%20garantir%20a%20limpeza%20e,lave%2Da%20exclusivamente%20com%20detergente

Schümann K, Solomons NW. Perspective: What makes it so difficult to mitigate worldwide anemia prevalence? Adv Nutr. 2017 May 15;8(3):401-408. doi: 10.3945/an.116.013847

Sheikh A, Dhingra-Kumar N, Kelley E, Kieny MP, Donaldson LJ. The third global patient safety challenge: tackling medication-related harm. Bull World Health Organ. 2017;95:546-546A. http://dx.doi.org/10.2471/BLT.17.198002

Silva CAM, Acker JIBV. O cuidado paliativo domiciliar sob a ótica de familiares responsáveis pela pessoa portadora de neoplasia. Rev Bras Enferm. 2007;60(2):150-4. https://doi.org/10.1590/S0034-71672007000200005

Silva FAC, Andrade PR, Barbosa TR, Hoffmann MV, Macedo CR. Representação do processo de adoecimento de crianças e adolescentes oncológicos junto aos familiares. Esc Anna Nery Rev Enferm. 2009;13(2):334-41. https://doi.org/10.1590/S1414-81452009000200014

Silva MM, Lima LS. Participation of the family in hospital-based palliative cancer care: Perspectives of nurses. Rev Gaucha Enferm. 2014;35(4):14-19. https://doi.org/10.1590/1983-1447.2014.04.45820

Silva P. Farmacologia básica e clínica. 6. ed. Rio de Janeiro: Guanabara Koogan; 2006. p. 1186-96.

Simons SH, Tibboel D. Pain perception development and maturation. Semin Fetal Neonatal Med. 2006 Aug;11(4):227-31. doi: 10.1016/j.siny.2006.02.010

Taketomo CK, Hodding JH, Kraus DM. Pediatric dosage handbook. Hudson, OH: Lexi-Comp; 1992.

Teles KM, Medeiros-Souza P, Lima FAC, Araújo BG, Lima RAC. Rotina de administração de ciclofosfamida em doenças autoimunes reumáticas: uma revisão. Rev Bras Reumatol. 2017;57(6):596-604. https://doi.org/10.1016/j.rbr.2016.04.009

The cause of cancer. JAMA. 2021 Jan 19;325(3):311. doi: 10.1001/jama.2020.17762

Tokgöz HB, Altan F. Hypericum perforatum L.: a medicinal plant with potential as a curative agent against obesity-associated complications. Mol Biol Rep. 2020 Nov;47(11):8679-8686. doi: 10.1007/s11033-020-05912-7

Toscano C, Kosim L. Cartilha de vacinas: para quem quer mesmo saber das coisas. Brasília: Organização Pan-Americana da Saúde; 2003.

Urtasun Erburu A, Herrero Cervera MJ, Cañete Nieto A. Cancer in the first 18 months of life. An Pediatr (Barc). 2020;93:358–366. https://doi.org/10.1016/j.anpede.2020.02.006

Uthamacumaran A. Cancer: A turbulence problem. Neoplasia. 2020 Dec;22(12):759-769. https://doi.org/10.1016/j.neo.2020.09.008

Varlotto J, Stevenson MA. Anemia, tumor hypoxemia, and the cancer patient. Int J Radiat Oncol Biol Phys. 2005 Sep 1;63(1):25-36. doi: 10.1016/j.ijrobp.2005.04.049

von Mackensen S, Schleicher C, Heine S, Graf N, Eichler H. Health-related quality of life, treatment satisfaction and adherence outcomes of haemophilia patients living in a German rural region. Hämostaseologie. 2020;40(5):631-641. doi: 10.1055/a-1141-1175

Ward EJ, Henry LM, Friend AJ, Wilkins S, Phillips RS. Nutritional support in children and young people with cancer undergoing chemotherapy. Cochrane Database Syst Rev. 2015 Aug 24;2015(8):CD003298. doi: 10.1002/14651858.CD003298.pub3

Wong M, Mayoh C, Lau LMS, Khuong-Quang DA, Pinese M, Kumar A, *et al*. Whole genome, transcriptome and methylome profiling enhances actionable target discovery in high-risk pediatric cancer. Nat Med. 2020 Nov;26(11):1742-1753. doi: 10.1038/s41591-020-1072-4

Woodgate RL. Siblings' experiences with childhood cancer: a different way of being in the family. Cancer Nurs. 2006 Sep-Oct;29(5):406-14. doi: 10.1097/00002820-200609000-00010

World Health Organization. Cancer pain relief and palliative care in children [Internet]. Geneva: World Health Organization; 1998 [cited 2021 set. 7]. Available from: https://apps.who.int/iris/handle/10665/42001

World Health Organization. Coronavirus disease (COVID-19): Vaccines [Internet]. Geneva, 17 May 2022 [cited 2021 Apr 8]. Available from:https://www.who.int/news-room/q-a-detail/coronavirus-disease-(covid-19)-vaccines

World Health Organization. Global priorities for research in patient safety [Internet]. Geneva: World Health Organization; 2008 [cited 2023 maio 21]. Available from: https://www.who.int/publications/i/item/WHO-IER-PSP-2008.13.

World Health Organization. Towards eliminating avoidable harm in health care [Internet]. Geneva: World Health Organization; 2021 [cited 2023 maio 21]. Available from: https://www.who.int/publications/m/item/the-final-draft-of-the-global-patient-safety-action-plan

World Health Organization. Vaccines and immunization: What is vaccination? [Internet]. Geneva, 30 Aug. 2021 [cited 2021 Apr 8]. Available from: https://www.who.int/news-room/q-a-detail/vaccines-and-immunization-what-is-vaccination

World Health Organization. WHO launches global effort to halve medication-related errors in 5 years [Internet]. Geneva, 2017 Mar 29 [cited 2023 maio 21]. Available from: https://www.who.int/news/item/29-03-2017-who-launches-global-effort-to-halve-medication-related-errors-in-5-years

World Health Organization. WHO model list of essential medicines for children. First List, Oct. 2007. Geneva: WHO; 2007.

Yang D, Pearce RE, Wang X, Gaedigk R, Wan YJ, Yan B. Human carboxylesterases HCE1 and HCE2: ontogenic expression, inter-individual variability and differential hydrolysis of oseltamivir, aspirin, deltamethrin and permethrin. Biochem Pharmacol. 2009 Jan 15;77(2):238-47. doi: 10.1016/j.bcp.2008.10.005

Zambrone FAD, Corrêa CL, Amaral LMS. A critical analysis of the hepatotoxicity cases described in the literature related to Herbalife® products. Braz J Pharm Sci. 2015;51(4):785-796. https://doi.org/10.1590/S1984-82502015000400004

Zardo GP, Farah FP, Mendes FG, Franco CAGS, Molina GVM, Melo GN, *et al*. Vacina como agente de imunização contra HPV. Ciênc Saúde Coletiva. 2014;19(9):3799-3808. https://doi.org/10.1590/1413-81232014199.01532013

Nutritional Care

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1 FOOD CARE (NUTRITION)

Taking care of the diet is essential to keep a good nutritional state, as a healthy and balanced diet can be decisive for a good recovery and treatment success. Children and teenagers with cancer might show several symptoms which can interfere with food digestion, and because of that, they should be assisted by a nutritionist to ensure adequate growth and development, help improve immune response, enhance tolerance and response to treatment in addition to improving quality of life (Instituto Nacional de Câncer José Alencar Gomes da Silva - INCA, 2014, 2020; Joffe et al., 2019).

Nutritional assistance should be individualized and include nutritional assessment in the long run (Dornelles et al., 2009; INCA, 2014).

A malnourished child or a child with weight loss gets weaker (low tolerance) and might need more care and interventions, such as hospitalizations during treatment (Sala et al., 2004; Antillon et al., 2013). A malnourished child is proner to infections, and their response to treatment may be extended, or they may have other complications as the chemotherapeutic drug might weaken the child (Garófolo, 2005; Pribnow et al., 2017; Joffe et al., 2019).

When the doctor runs some bloodwork and sees that the result is not according to what is expected, it might be necessary to interrupt the treatment until the child recovers. Thus, the treatment might take longer (Sala et al., 2004; Antillon et al., 2013).

On the other hand, the child's weight gain or obesity does not necessarily means they are well-nourished because the increase in body fat interferes with the concentration of cancer-treatment drugs in the body. The sound effects of the medications may be initially reduced because the chemotherapeutic drug hides in the fat. Later, the harmful effects increase because what is in the fat is slowly released into the body. Considering that we are talking about chemotherapeutic drugs, they can be dangerous for the child. Thus, the nutritionist and the doctor will monitor any body changes in the child and help continue healthy eating habits (NCD Risk Factor Collaboration, 2014; Ward et al., 2014; Hill et al., 2018; Wiernikowski, Bernhardt, 2020).

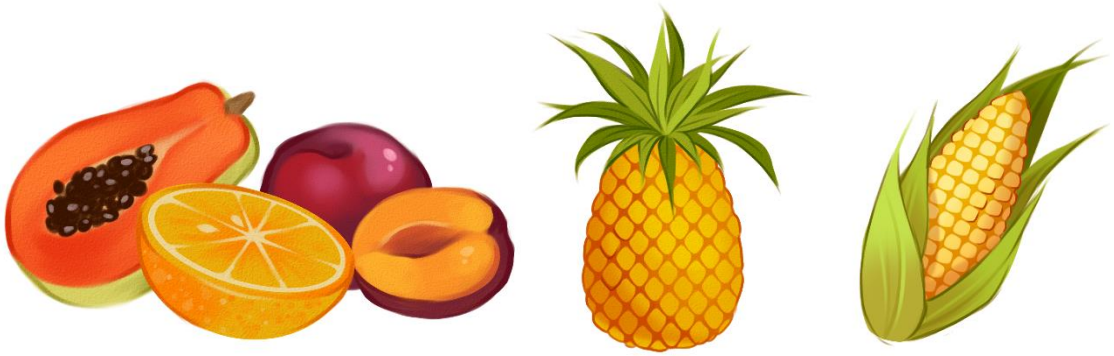
The treatment with the chemotherapeutic drug causes common side effects: nausea, vomiting, change in taste, loss of appetite, changed sense of smell, and pain caused by wounds in the mouth (mucositis). Nutritional follow-up will help the child consume food well (Wiernikowski, Bernhardt, 2020).

1.1 Eating habits

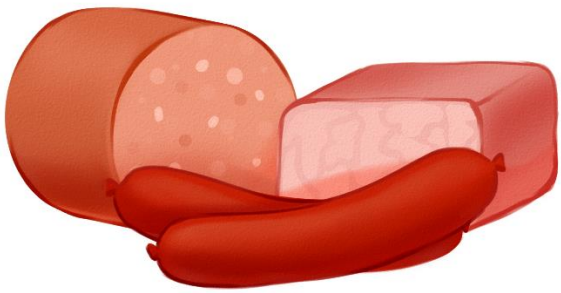
Eating habits are another essential aspect. The concern is that the whole family improves the consumption of healthy foods, so the child better adheres to the treatment

(INCA, 2014, 2020). Here are some tips that will help you put a sound eating routine into practice:

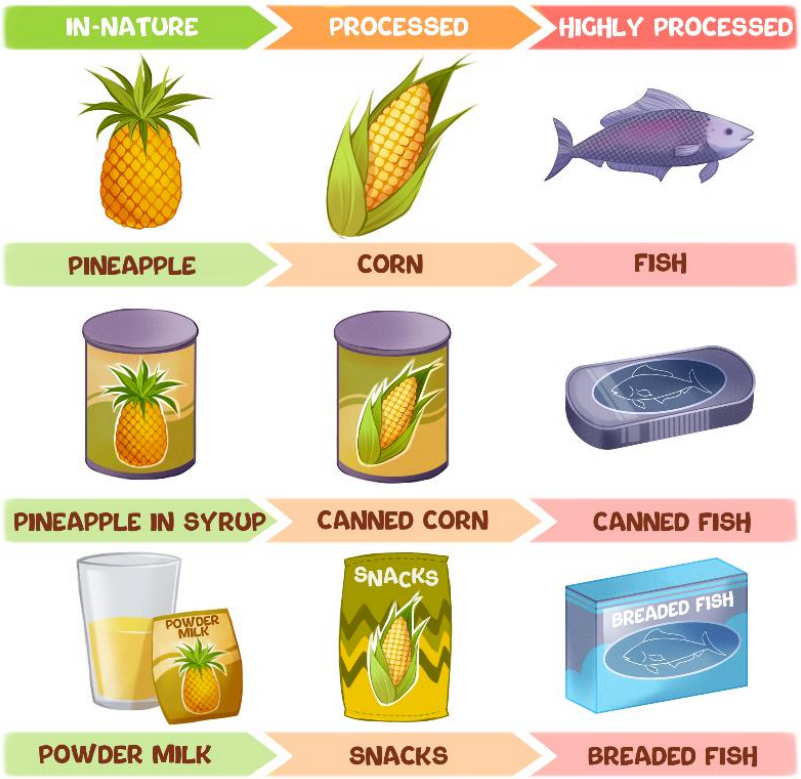
- Respect times, avoiding skipping meals and spending long periods without eating (fasting), (INCA, 2020);
- Amongst all possible recommendations, we can mention the fractionation of food into various meals to avoid nausea and vomiting (Sala et al., 2004);
- Give preference to less solid foods by including porridge, soups, and vitamins to facilitate swallowing (Sala et al., 2004);
- In cases of pain while swallowing or chewing, adjust food consistency to the level of acceptability, and use different methods to facilitate ingestion, for example, using a straw (INCA, 2014);
- Eat slowly and chew the food well (INCA, 2020);
- Include fruits and vegetables in the diet because they are rich in nutrients and will help their intestines work (INCA, 2020);



- Exclude industrialized foods, ultra-processed foods such as stuffed, cookies, canned foods, snacks, sodas, and instant noodles (INCA, 2020);



Examples of in natura, processed and ultra-processed foods:



- Always take a bottle of water and track daily water intake, observing signs of malnutrition such as dry mouth, dry lips, and constipation (INCA, 2020).

1.2 Lack of appetite

The child's lack of appetite may be related to various reasons, from nausea, and alteration in smell and taste (sense of flavor), to difficulty chewing and swallowing foods. Clinical management is the awareness that, even though one is not hungry, one must eat because it is essential for the treatment and helps increase disposition (INCA, 2014, 2020).

The acceptance and stimulation of appetite are recommended. Thus, it is essential to include conversations with the child before meals to understand their preferences better and, therefore, go on adapting meal preparations. Besides, working on the presentation of the dish can give visual stimulus. So, give priority to varied and colorful dishes (INCA, 2020).

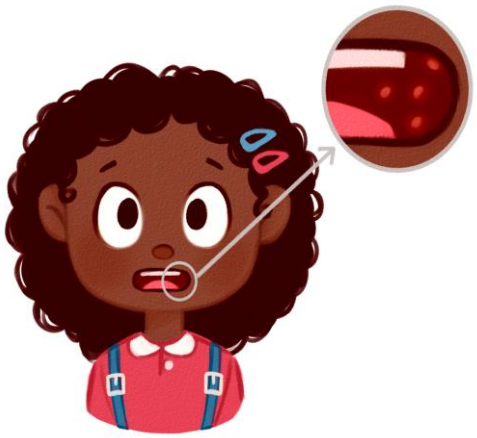
1.3 Nausea

Nausea is characterized by discomfort followed or not by vomiting, being one of the most prevalent undesired effects during chemotherapy or radiotherapy. It may occur before, during, and after the sessions (McCulloch et al., 2014; Flank et al., 2017). There are several conducts for avoiding situations that cause nausea besides alternatives with medications, which are generally given prophylactically (as prevention) before the chemotherapy sessions (INCA, 2014, 2020). Some conducts that can relieve nausea are:

- Eat in a well-ventilated place and avoid the smell of the meal staying for too long in the room (INCA, 2014);
- When the child is nauseated or vomiting, offer them the meal for a second time after around 20 minutes (Sociedade Brasileira de Nutrição Oncológica – SBNO, 2021);
- Fraction the meals, offering smaller amounts many times a day, from 6 to 8 times, thus avoiding long periods without eating (INCA, 2014; SBNO, 2021);
- Avoid very hot preparations, spices with solid smell, fatty or fried foods, and very sweet foods (INCA, 2014);
- Cold foods help relieve nausea (INCA, 2014; SBNO, 2021);
- Sucking ice chips 40 minutes before meals can also help reduce nausea (INCA, 2014; SBNO, 2021);
- Be attentive after meals, keeping mouth hygiene and resting in a sitting position after meals, preferably wearing comfortable clothes (INCA, 2020);
- Keep the head of the bed elevated (45º) during and after meals for at least 30 minutes before lying down (SBNO, 2021);
- Wear light clothing which is not very tight (SBNO, 2021);
- With the health team caring for the child, adjust the prescription and times of the medications to avoid vomiting (antiemetics), (SBNO, 2021).

2 PROBLEMS RELATED TO INGESTION AND DIGESTIONS

2.1 Mucositis



Mucositis is a toxic inflammatory reaction induced by chemotherapy that can affect the whole GI tract, from the mouth to the anus. Depending on the medication plan, it affects 30 to 75% of the patients in treatment. The most common symptoms of mucositis are pain, inflammation, dry mouth, wounds, and desquamation of the oral mucosa and lips, and they can also involve bleeding (Wiernikowski, Bernhardt, 2020). Some improvements can be made to relieve the effects caused by mucositis. Here are some recommendations which can be adopted in the daily life of the child:

- Acidic, spicy, or very salty foods are contraindicated (INCA, 2014; McCulloch et al., 2014; Kuiken et al., 2015; Kuiken et al., 2017);
- Avoid hard and dry foods or foods that make it difficult to chew (McCulloch et al., 2014; Kuiken et al., 2015; Kuiken et al., 2017);
- Use room-temperature cold foods (Sala et al., 2004);
- Reduce salt in preparations (INCA, 2020);
- Avoid raw fresh vegetables (INCA, 2020);
- Keep adequate water intake, avoiding sugary drinks (INCA, 2020);
- Adjust the consistency of the foods (solid, pasty, liquid) to the child's chewing tolerance level. It is also possible to take small sips of water and juice to help swallow the food (McCulloch et al., 2014; Kuiken et al., 2015; Kuiken et al., 2017);
- Together with the health team that takes care of the child, adjust the prescription and times of pain medications (painkillers), (INCA, 2020);
- Keep good oral hygiene, according to the child's clinical conditions, from brushing teeth with an extra soft toothbrush to rinsing with water or chamomile tea, following the dentist's orders (INCA, 2020).

Mucositis can also be severe, bringing consequences such as difficulty eating, leading to weight loss. When mucositis is severe, the child cannot eat, so tube feeding (enteral nutrition) is necessary, so the child does not lose much weight (Kuiken et al., 2015; Kuiken et al., 2017). In cases in which the child needs this supplementation through tube feeding, it is preferable to start with an enteral tube because it will preserve intestinal function, stimulating the digestive system and maintaining its normal position (Trehan et al., 2020).

Nowadays, some treatments help reduce mucositis, such as cold therapy (cryotherapy), which uses ice or cold packs in the local of the wounds as treatment, or treatment with laser (laser therapy), which reduces pain and inflammation (McCulloch et al., 2014; Vitale et al., 2017). However, prevention is still the most accessible alternative, consisting of water-based mouth rinsing and good oral hygiene. Thus, the child is less susceptible to infections by microorganisms such as bacteria and fungi, which can lead to more serious infections and demand higher care (McCulloch et al., 2014; Vitale et al., 2017; INCA, 2020).

2.2 Constipation

Difficulty in pooping (constipation) is often related to using medications to control pain, for example, opioids, but it can also be related to diet (INCA, 2014, 2020; SBNO, 2021). Here are some essential recommendations to avoid constipation:

- Intake of liquids as recommended by the health team responsible for the child, preferably water (INCA, 2014; SBNO, 2021);
- Add to the diet foods that ease constipation, such as prunes, papaya, orange with pulp, and foods rich in fiber (INCA, 2014; SBNO, 2021). If possible, eat these foods raw (Consenso Brasileiro de Constipação Intestinal Induzida por Opioides, 2009; Santos, 2002);
- Avoid food with the opposite effect that is, those that cause constipation, such as manzano banana and burro banana, guava, potato, cassava, etc. (INCA, 2014; SBNO, 2021);
- Fractioning in 5 to 6 meals/day with a 3 to the 4-hour interval (Lembo, Camilleri, 2003; Corrêa, Shibuya, 2007);
- Offer foods with laxative properties: papaya, avocado, mango, orange, plum, watermelon, and vegetables (5 portions/day);

- If possible, use probiotics and prebiotics (functional foods), which help treat and prevent constipation because they normalize bowel movements and improve immunity (Marteau, Boutron-Ruault, 2002).

2.3 Diarrhea

Chemotherapeutic drugs can also cause diarrhea. Eating foods that constipate, such as manzano banana, guava, potato, carrot, and cassava, is suggested.

Besides adjusting the diet, it is also essential to keep hydrated. Take lots of fluids (according to the doctor's and nutritionist's directions) and prefer water, coconut water, and natural juices besides the saline (according to professional rules) to replenish electrolytes lost in constant evacuations. Food should be fractionated, and volume reduced, between 6 to 8 meals daily. Avoid laxative foods: raw vegetables, papaya, orange, avocado, beans, fried foods, and sweets (INCA, 2014, 2020; SBNO, 2021).

Even with diarrhea, the diet should be kept, but fatty foods should be avoided. Give preference to lighter low-fat foods such as skimmed milk and lean meats. Avoid foods that may cause gas, such as beans, milk, and dairy (Santana Martínez et al., 2015; Segal et al., 2014; PDQ, 2021). If diarrhea persists for over a week, a health professional should be consulted to investigate the possible cause, which may be related to intolerance to a component in the diet, such as milk or gluten, and adjust to these limitations in the diet. Washing hands before

each meal is crucial in preventing contamination that leads to intestinal infections (INCA, 2014, 2020).

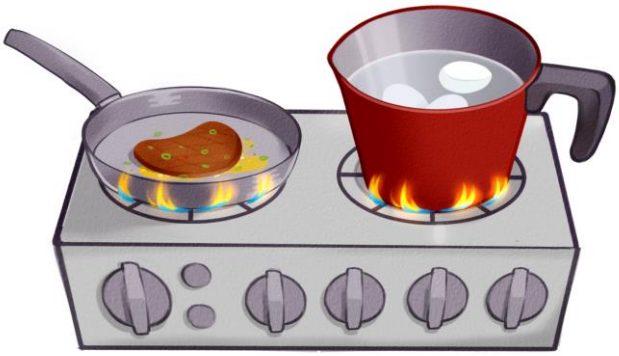
3 STEP-BY-STEP FOR WASHING AND PRESERVING FOODS IN THE FRIDGE

There are four steps when preparing and storing food:

1. **WASH**: hands, foods, utensils, equipment, and the whole environment used for cooking.

2. **SEPARATE**: raw foods such as meats, which must not get in contact with already-cooked foods or those consumed in natura, such as fruits.

3. **COOK**: eggs, meats in general, and other foods that should be cooked at high temperatures and in due time so all bacteria are eliminated. Meats must show no blood and pinkish color, for example.



4. **REFRIGERATE**: all foods must be stored in the fridge in closed containers after preparation.

Besides the fore-mentioned four steps, it is essential to observe some directions for shopping, storing, preparation, defrosting, cooking, and leftovers.

3.1 Shopping

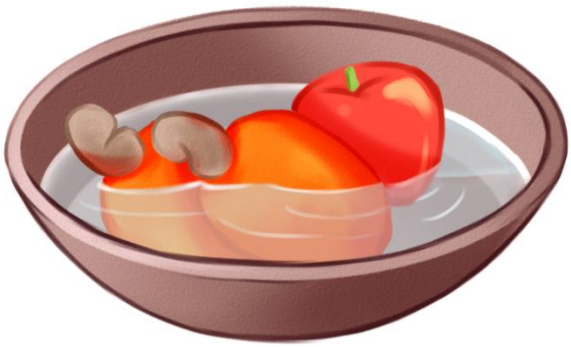
- Pick up refrigerated or frozen foods last.
- Do not buy expired foods or with different smells, colors, and textures.
- Observe if the package is sealed. Cracked glasses, swollen cans, crumpled boxes, punctured containers, and bags are signs that the food is not of perfect quality for consumption.

- Avoid buying foods in bulk.

3.2 Storing

- Store in a place at a temperature specified by the manufacturer.
- Store perishable foods (meats, dairy, fruits, and vegetables) in the fridge.
- Refrigerate perishable foods (meats, milk, dairy, eggs, fruits, and vegetables) until 1 hour after preparation or purchase.

WARNING!! Fruits and vegetables must be sanitized using one tablespoon of chlorine solution (specially made for foods) in 1 liter of water for 10 minutes and rewashing them in running water (Agência de Nacional de Vigilância Sanitária, 2004).



3.3 Defrosting

There are three ways to defrost:

- **In the fridge**: take the food from the refrigerator and put it in the fridge right away until it is defrosted. Ensure that the meats' "juices" do not drip over other foods.
- **In the microwave oven**: put the food directly in the microwave oven after taking them from the freezer.
- **Directly in the stove**: take the frozen foods out of the freezer and put them in a pan to cook them immediately.

3.4 Consumption

- Throw away any food with mold (cutting off the mold will not remove microorganisms that can harm health).
- Do not eat foods after their expiration date.

3.5 Leftovers

- Throw away any food that has been at room temperature for more than one hour.
- Use cooked leftovers for up to 24 hours.

4 FOOD AND MEDICATION CARE

Medications have a vital role in the treatment. Thus, they need attention in their administration. Some medicines should be taken on an empty stomach; others, after or together with meals; and there are others with precise intervals according to the time they take to be absorbed, that is, get into the bloodstream (Santana Martínez et al., 2015; Segal et al., 2014). The recommendations must be individualized for each medication taken through the mouth (oral administration) because there are medications that like food, which means they can be taken on a full stomach since their concentration will not decrease- it can even boost their effect; some medications administered with food, or some specific foods may have their attention in the blood decreased. In this case, having a pharmacist and a nutritionist around is crucial to determine which foods are inappropriate or should be taken with care.

Following the instructions passed on is essential for the success of the treatment (therapeutic success). Some foods directly affect the medication's chemical transformation, which happens inside the body (metabolization), and the medication's characteristics, leading to loss of the effect and the increase of harmful effects (Segal et al., 2014; Santana Martínez et al., 2015). Thus, during the consult, it is helpful to be clear as to which foods interfere with the medications, bearing in mind that teas, juices, vitamin supplements, and spices are also included in the care.

Those are some of the most known examples that affect the medications' breakdown to be eliminated, which can increase the concentration of the chemotherapeutic drug in the blood or even decrease their effects. Amongst the natural products and vitamins are grapefruit, St. John's wort, green tea, ginkgo biloba, ginseng, vitamins C and E (PDQ, 2021; Cancer Research UK, 2019).

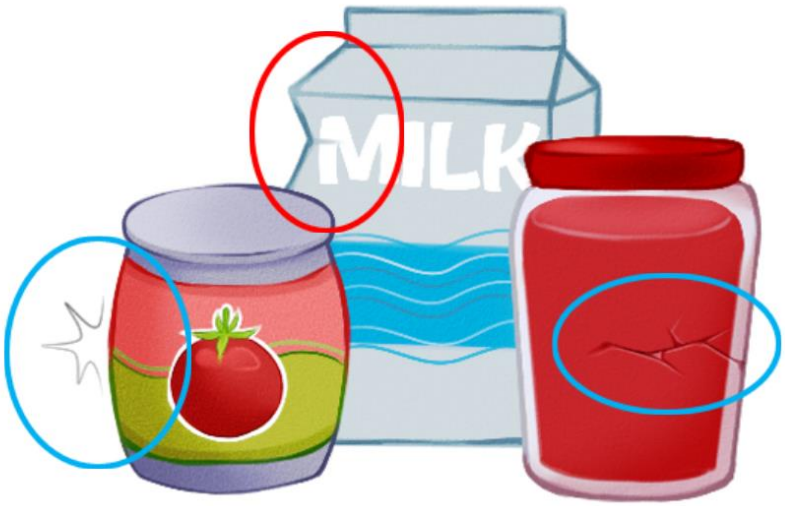
So, the intake of any houseplant, including tea, must be informed to the pharmacist, doctor, and nutritionist so they can check if these natural products are compatible with the chemotherapeutic drugs the child is taking. Be careful with the myth that says, “If it does not do good, it will not do bad either.” This is usually a largely used statement for the consumption of natural products.

5 DECREASE IN THE DEFENSE OF THE BODY (LOW IMMUNITY)

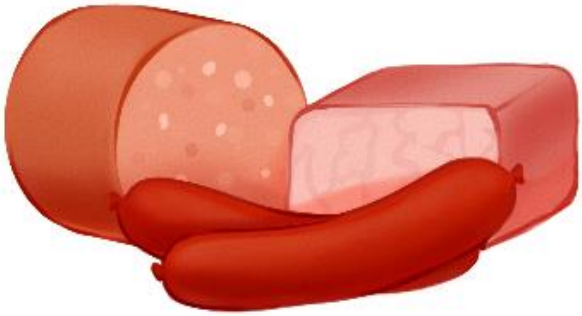
5.1 Neutropenia/leukopenia

Neutropenia and leukopenia (low levels of the defense cells of the body that help fight infections) are changes in which the body's defenses are down, increasing the chances of infections. Thus, the child should have a safe diet since many bacteria and other microorganisms may contaminate the food and proliferate (INCA, 2020; SBNO, 2021). There are some precautions below:

- Always check, before buying, if the package is not damaged and if the food is before its use-by date, always keeping it at the temperature shown on the label (INCA, 2020; SBNO, 2021);



- Buy fresh foods, and avoid processed foods (such as mortadella, sausage, and ham), (INCA, 2020; SBNO, 2021);



- Wash the packages with coconut or mild soap before they go into the fridge or freezer (INCA, 2020);

- Drink only drinking water, boiled or mineral water (INCA, 2020; SBNO, 2021);
- Wash hands well before eating or preparing food. Do not prepare food if hands are injured (SBNO, 2021);
- Eat well-cooked eggs and meats (INCA, 2020);
- Do not eat oleaginous foods (nuts, almond), (SBNO, 2021);

- Have sterilized or pasteurized milk and pasteurized dairy only (SBNO, 2021);

- Eat pasteurized honey only (SBNO, 2021). However, it is contraindicated to give honey to children younger than one year old due to their low immunity against a bacterium (Clostridium botulinum - C. botulinum), which can cause botulism in its severe because of the toddlers' fragile immune system (Oduwole et al., 2018);

- When eating out, prefer restaurants you already know and are careful with hygiene and food safety. Besides, avoid eats foods that have not been well-cooked and raw salad (SBNO, 2021);
- Avoid drinking chimarrão (a Brazilian drink) because of the inhalation of dry yerba mate (SBNO, 2021);

- Wash dishes well with soap and change the sponge every seven days (INCA, 2020).

REFERENCES

Agência Nacional de Vigilância Sanitária. [Handbook on good practices for food services: Resolution - RDC nº 216/2004]. Brasília: Anvisa; 2004. Portuguese

Antillon F, Rossi E, Molina AL, Sala A, Pencharz P, Valsecchi MG, *et al*. Nutritional status of children during treatment for acute lymphoblastic leukemia in Guatemala. Pediatr Blood Cancer. 2013 Jun;60(6):911-5. doi: 10.1002/pbc.24377

Cancer Research UK. Food and drink to avoid during cancer treatment. Last reviewed: 12 Aug 2019 [cited 2021 Sep 18]. Available from: https://www.cancerresearchuk.org/about-cancer/treatment/cancer-drugs/how-you-have/foods-drinks-avoid

Consenso Brasileiro de Constipação Intestinal Induzida por Opioides. Rev Bras Cuid Paliativos. 2009;2(3 Supl 1):1-33.

Corrêa PH, Shibuya E. Administração da terapia nutricional em cuidados paliativos. Rev Bras Cancerol. 2007;53(3):317-23.

Dornelles CTL, Silveira CRM, Cruz LB, Refosco LF, Simon MIS, Maraschin T. Protocolo de atendimento e acompanhamento nutricional pediátrico por níveis assistenciais. Rev HCPA [Internet]. 2009 [cited 2023 June 19];29(3): 229-238. Available from: https://seer.ufrgs.br/index.php/hcpa/article/view/8227

Flank J, Sparavalo J, Vol H, Hagen L, Stuhler R, Chong D, *et al.* The burden of chemotherapy-induced nausea and vomiting in children receiving hematopoietic stem cell transplantation conditioning: a prospective study. Bone Marrow Transplant. 2017;52(9):1294-1299. doi: 10.1038/bmt.2017.112

Garófolo A. Diretrizes para terapia nutricional em crianças com câncer em situação crítica. Rev Nutr. 2005;18(4):513-527. https://doi.org/10.1590/S1415-52732005000400007

Hill R, Hamby T, Bashore L, Rapisand S, Galipp K, Heym K, *et al*. Early Nutrition Intervention Attenuates Weight Gain for Pediatric Acute Lymphoblastic Leukemia Patients in Maintenance Therapy. J Pediatr Hematol Oncol. 2018 Mar;40(2):104-110. doi: 10.1097/MPH.0000000000000975

Instituto Nacional de Câncer José Alencar Gomes da Silva. Consenso nacional de nutrição oncológica: paciente pediátrico oncológico. Rio de Janeiro: INCA; 2014.

Instituto Nacional de Câncer José Alencar Gomes da Silva. Guia de nutrição para pacientes e cuidadores: orientações aos usuários. 4. ed. Rio de Janeiro: INCA; 2020.

Joffe L, Dwyer S, Glade Bender JL, Frazier AL, Ladas EJ. Nutritional status and clinical outcomes in pediatric patients with solid tumors: A systematic review of the literature. Semin Oncol. 2019 Feb;46(1):48-56. doi: 10.1053/j.seminoncol.2018.11.005

Kuiken NS, Rings EH, Tissing WJ. Risk analysis, diagnosis and management of gastrointestinal mucositis in pediatric cancer patients. Crit Rev Oncol Hematol. 2015 Apr;94(1):87-97. doi: 10.1016/j.critrevonc.2014.12.009

Kuiken NSS, Rings EHHM, van den Heuvel-Eibrink MM, van de Wetering MD, Tissing WJE. Feeding strategies in pediatric cancer patients with gastrointestinal mucositis: a multicenter prospective observational study and international survey. Support Care Cancer. 2017 Oct;25(10):3075-3083. doi: 10.1007/s00520-017-3715-7

Lembo A, Camilleri M. Current concepts: chronic constipation. N Engl J Med. 2003;349(14):1360-8.

Marteau P, Boutron-Ruault MC. Nutritional advantages of probiotics and prebiotics. Br J Nutr. 2002 May;87 Suppl 2:S153-7. doi: 10.1079/BJNBJN2002531

McCulloch, R Hemsley J, Kelly P. Symptom management during chemotherapy. Paediatr Child Health. 2014;28(4):166-171. https://doi.org/10.1016/j.paed.2013.10.007

NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128·9 million children, adolescents, and adults. Lancet. 2017 Dec 16;390(10113):2627-2642. doi: 10.1016/S0140-6736(17)32129-3

Oduwole O, Udoh EE, Oyo-Ita A, Meremikwu MM. Honey for acute cough in children. Cochrane Database Syst Rev. 2018 Apr 10;4(4):CD007094. doi: 10.1002/14651858.CD007094.pub5

PDQ Integrative, Alternative, and Complementary Therapies Editorial Board. Cancer therapy interactions with foods and dietary supplements (PDQ®): Health Professional Version. 2021 Jul 07. In: PDQ Cancer Information Summaries [Internet]. Bethesda (MD): National Cancer Institute (US); 2002– [cited 2021 Sep 16]. PMID: 33079503. Available from: https://www.cancer.gov/about-cancer/treatment/cam/hp/dietary-interactions-pdq

Pribnow AK, Ortiz R, Báez LF, Mendieta L, Luna-Fineman S. Effects of malnutrition on treatment-related morbidity and survival of children with cancer in Nicaragua. Pediatr Blood Cancer. 2017 Nov;64(11). doi: 10.1002/pbc.26590

Sala A, Pencharz P, Barr RD. Children, cancer, and nutrition--A dynamic triangle in review. Cancer. 2004 Feb 15;100(4):677-87. doi: 10.1002/cncr.11833

Santana Martínez S, Marcos Rodríguez JA, Romero Carreño E. Oral chemotherapy: food-drug interactions. Farm Hosp. 2015;39(4):203-9. doi: 10.7399/fh.2015.39.4.8883

Santos HS. Terapêutica nutricional para constipação intestinal em pacientes oncológicos com doença avançada em uso de opiáceos: revisão. Rev Bras Cancerol. 2002;48(2):263-69.

Segal EM, Flood MR, Mancini RS, Whiteman RT, Friedt GA, Kramer AR, *et al.* Oral chemotherapy food and drug interactions: a comprehensive review of the literature. J Oncol Pract. 2014 Jul;10(4):e255-68. doi: 10.1200/JOP.2013.001183

Sociedade Brasileira de Nutrição Oncológica. I Consenso brasileiro de nutrição oncológica da SBNO. Organização: Nivaldo Barroso de Pinho. Rio de Janeiro: Edite; 2021. 164 p.

Trehan A, Viani K, Cruz LB, Sagastizado SZ, Ladas EJ. The importance of enteral nutrition to prevent or treat undernutrition in children undergoing treatment for cancer. Pediatr Blood Cancer. 2020 Jun;67 Suppl 3:e28378. doi: 10.1002/pbc.28378

Vitale MC, Modaffari C, Decembrino N, Zhou FX, Zecca M, Defabianis P. Preliminary study in a new protocol for the treatment of oral mucositis in pediatric patients undergoing hematopoietic stem cell transplantation (HSCT) and chemotherapy (CT). Lasers Med Sci. 2017 Aug;32(6):1423-1428. doi: 10.1007/s10103-017-2266-y

Ward E, DeSantis C, Robbins A, Kohler B, Jemal A. Childhood and adolescent cancer statistics, 2014. CA Cancer J Clin. 2014 Mar-Apr;64(2):83-103. doi: 10.3322/caac.21219

Wiernikowski JT, Bernhardt MB. Review of nutritional status, body composition, and effects of antineoplastic drug disposition. Pediatr Blood Cancer. 2020 Jun;67 Suppl 3:e28207. doi: 10.1002/pbc.28207

Hand Hygiene

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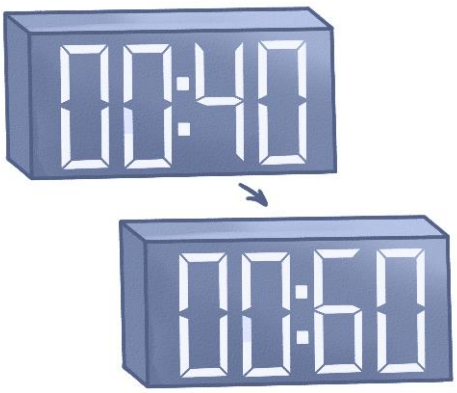
The hands are one of the main ways to transmit germs that can cause diseases. Routine activities can make hands dirty and contaminated. Thus, hand washing (cleaning) before and after handling the medications is essential to keep the safety of those who use and handle them, not to mention the drug itself (Huang et al., 1998; Boyce; Pittet, 2002; Silva et al., 2003).

Ideally, washing (cleaning) hands with water and soap should take 40 to 60 seconds (Larson et al., 2000; Hulburn et al., 2003; Agência Nacional de Vigilância Sanitária, 2009; Ministério da Saúde, 2013).

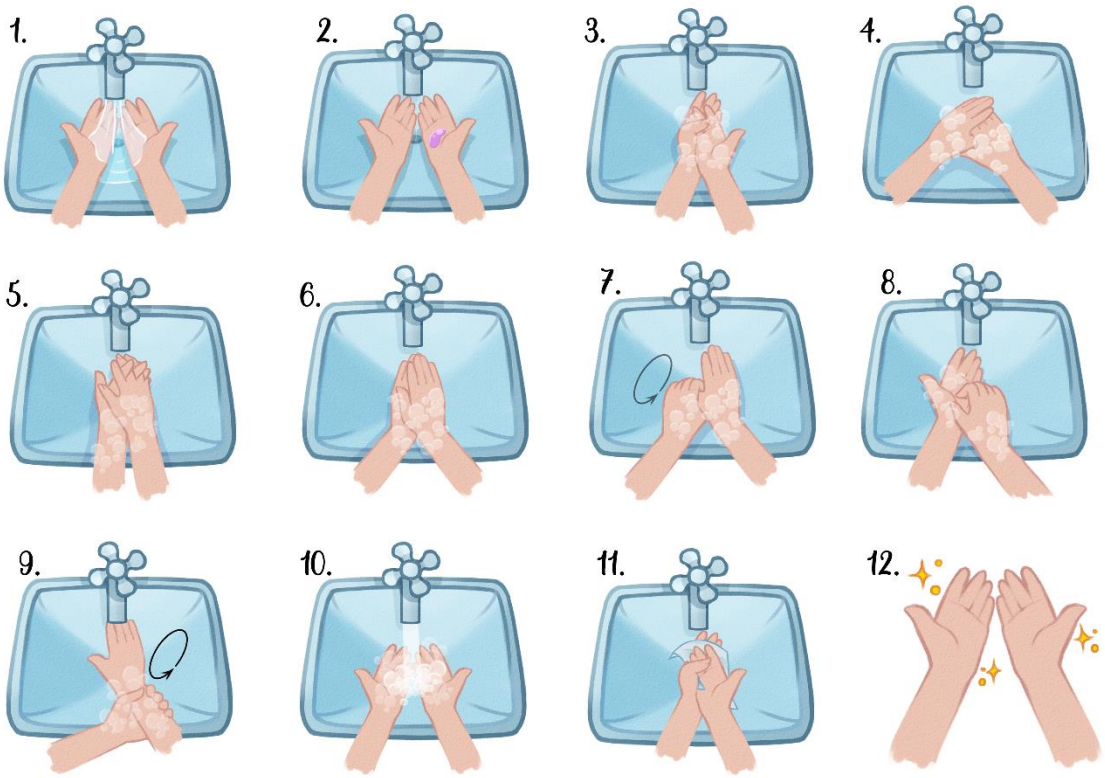
TIP: To help time the washing (cleaning), a good idea is to sing "Happy Birthday" twice in a row.



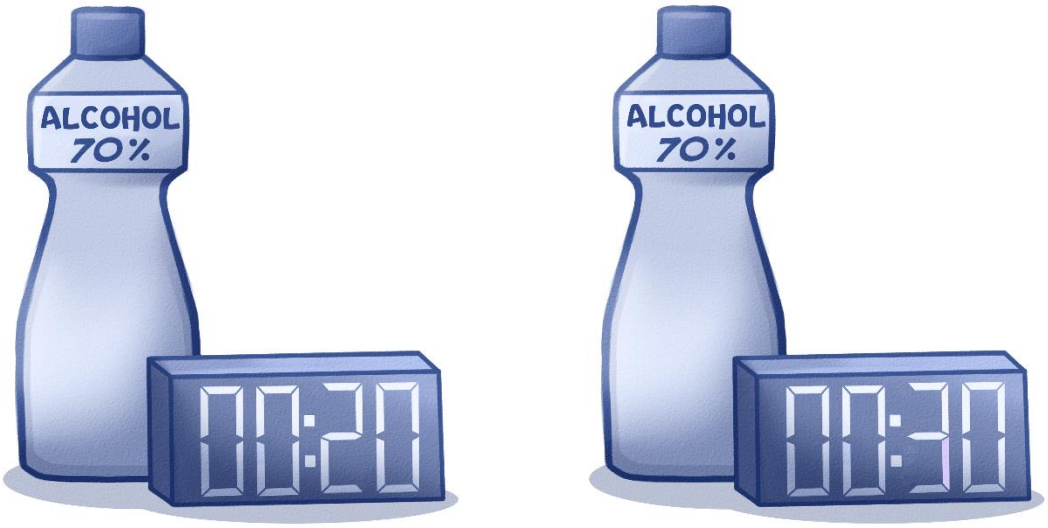
Hand washing step-by-step (Agência Nacional de Vigilância Sanitária, 2009; Ministério da Saúde, 2013):

1. Open the tap and wet your hands, but avoid touching the sink;
2. On the palm of your hand, apply an amount of liquid soap enough to cover the whole surface of the hand;
3. Lather the palm of your hands, rubbing them together;

4. Rub the palm of your right hand on the back of your left hand, interlacing your fingers, and vice-versa;
5. Interlace your fingers and rub the spaces between them;
6. Rub the back of the fingers in one hand with the palm of the opposite hand, and vice-versa, back and forth;
7. Rub the right thumb, with the help of the palm of the left hand, making a circular movement, and vice-versa;
8. Rub the finger pulps and nails of your left hand closed as a shell against the palm of the right hand (and vice-versa), making circular movements;
9. Rub the left wrist with the palm of the right hand (and vice-versa), making circular movements;
10. Rinse the hands removing all residues of soap from the fingertips to the wrists. Avoid direct contact of soapy hands with the tap;
11. Dry your hands with a disposable paper towel, if possible, or with a clean dry towel (do not use the towel for more than two days) from the hands to the wrists.

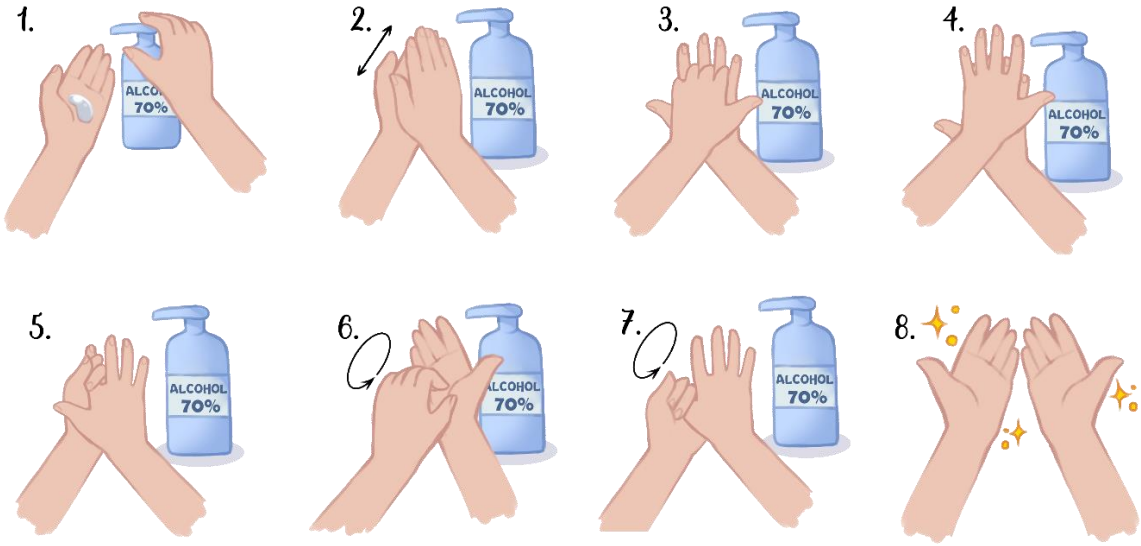


The hand sanitizer (70%) eliminates the microorganisms that may be in the hands, which also goes for cases in which there is no visible dirt. The process should take from 20 to 30 seconds (A. C. Camargo Cancer Center, 2022).



If using the hand sanitizer (70%), follow the steps below (A. C. Camargo Cancer Center, 2022):

1. Apply the sanitizer in a hand that is in the form of a shell;
2. Rub your hands, palm over palm;
3. With your fingers interlaced, rub the right palm on the back of your left hand, and vice-versa;
4. With your fingers interlaced, rub the back of your fingers with the palms of your hands;
5. With the palm of one hand, rub the fingers of the other hand, from the base to the tips, one finger at a time;
6. To clean the nails, make a shell with your hands and make vertical movements on each other - one goes up, and the other goes down;
7. "Embrace" the right thumb with your left hand and make circular movements, and vice-versa;
8. Wait until it dries, and that's it.



REMINDERS

- It is important that hand washing (cleaning) takes place before and after handling medications;
- Rinse your hands thoroughly, always removing all residues of soap;
- Avoid direct contact of soapy hands with the tap. If needed, use a paper towel to open the tap;
- Do not use water and soap at the same time as the sanitizer. First, do the washing (cleaning), and then follow the steps of the hand sanitizer;
- Dry your hands with a disposable paper towel from the hands to the wrists. Regular towels can be used if you are the only one to use them. Still, wash it every two to three days

REFERENCES

A. C. Camargo Cancer Center. Álcool em gel ou água e sabão? Data reforça a importância da limpeza correta das mãos [Internet]. São Paulo, 2022 Maio 5 [cited 2023 Jan 10]. Available from: https://accamargo.org.br/sobre-o-cancer/noticias/alcool-em-gel-ou-agua-e-sabao-limpeza-correta-das-maos

Agência Nacional de Vigilância Sanitária. Segurança do paciente em serviços de saúde: higienização das mãos. Brasília: Anvisa; 2009. 109 p.

Boyce JM, Pittet D; Centers for Disease Control and Prevention. Guideline for Hand Hygiene in Health-Care Settings. Recommendations of the Healthcare Infection Control Practices

Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. MMWR Recomm Rep. 2002 Oct 25;51(RR-16):1-45, quiz CE1-4.

Hilburn J, Hammond BS, Fendler EJ, Groziak PA. Use of alcohol hand sanitizer as an infection control strategy in an acute care facility. Am J Infect Control. 2003 Apr;31(2):109-16. doi: 10.1067/mic.2003.15

Huang YC, Lin TY, Leu HS, Wu JL, Wu JH. Yeast carriage on hands of hospital personnel working in intensive care units. J Hosp Infect. 1998 May;39(1):47-51. doi: 10.1016/s0195-6701(98)90242-0.

Larson EL, Early E, Cloonan P, Sugrue S, Parides M. An organizational climate intervention associated with increased handwashing and decreased nosocomial infections. Behav Med. 2000 Spring;26(1):14-22. doi: 10.1080/08964280009595749

Ministério da Saúde (BR), Programa Nacional de Segurança do Paciente. Anexo 01: Protocolo para a prática de higiene das mãos em serviços de saúde [Internet]. [Brasília]: Ministério da Saúde/Anvisa/Fiocruz; 2013 [cited 2023 Jan 10]. Available from: https://www.hospitalsantalucinda.com.br/downloads/prot_higiene_das_maos.pdf

Silva V, Zepeda G, Rybak ME, Febré N. Portación de levaduras en manos de estudiantes de Medicina [Yeast carriage on the hands of Medicine students]. Rev Iberoam Micol. 2003 Jun;20(2):41-5. Spanish.

Dental Care

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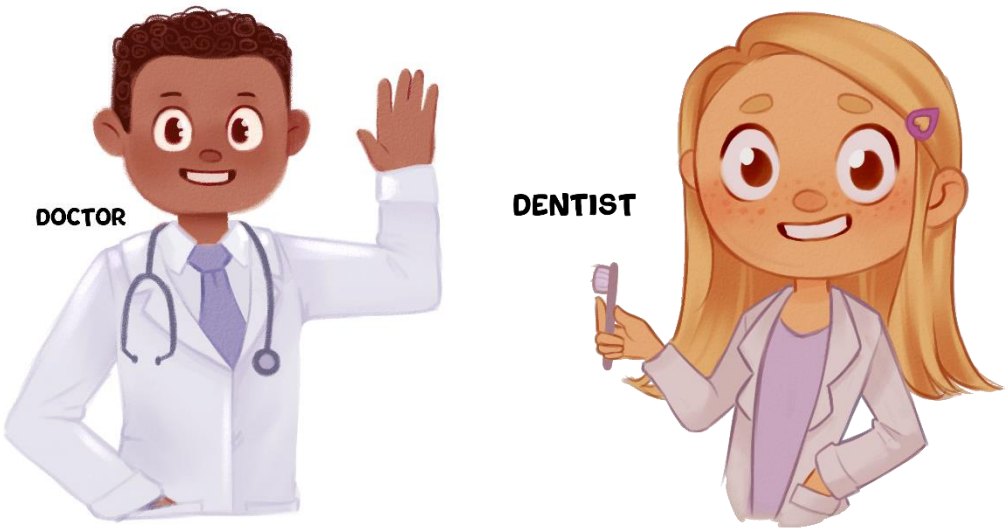
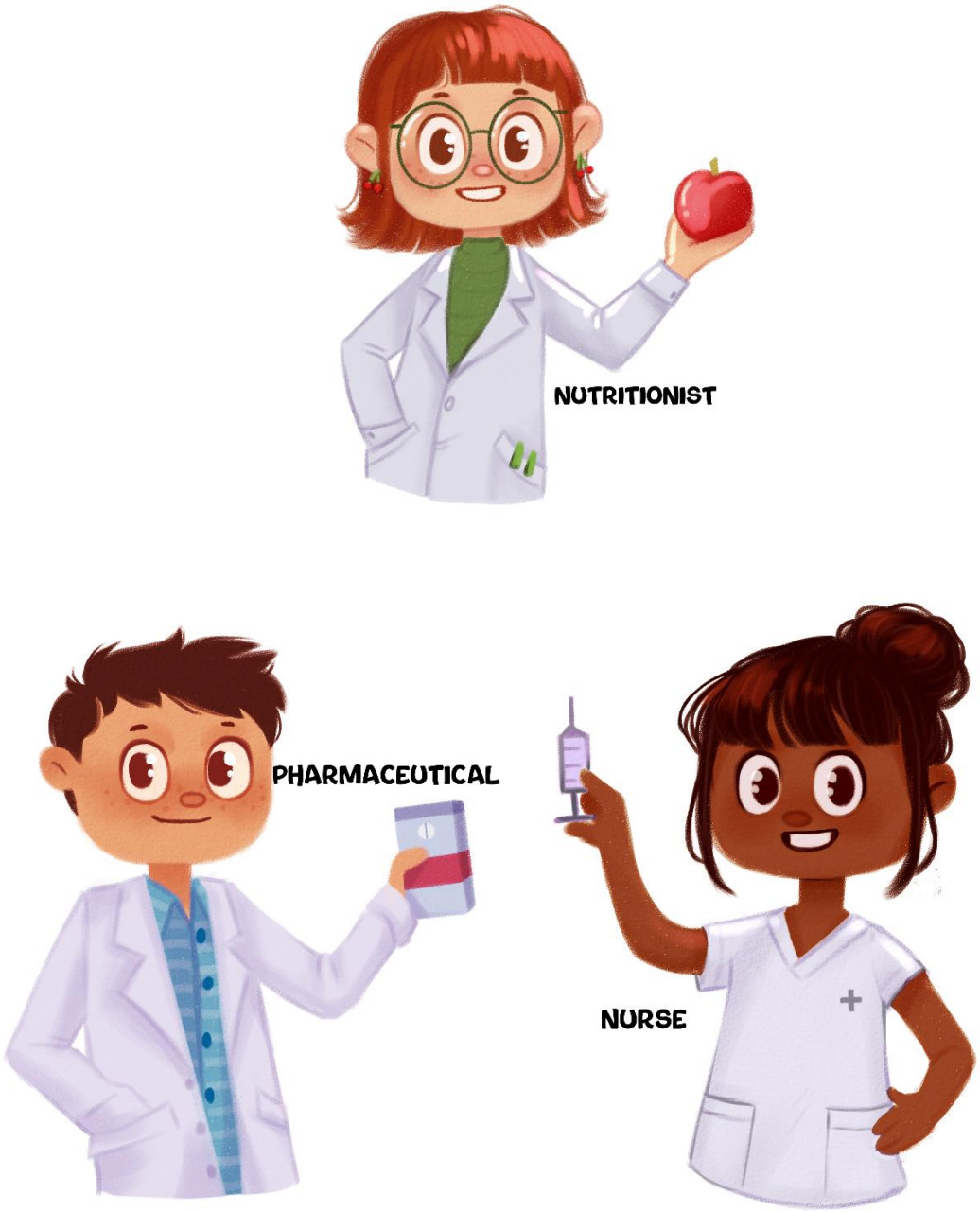
Mirela Fernandes Tamashiro Justi Bego
Flávia de Passos

Taking care of the health of the mouth (oral health) is very important throughout our lives, from childhood to old age, whether we are healthy or ill. Children with cancer must be assisted by a dentist from the diagnosis, during and after the end of the medical treatment, to keep the mouth and teeth healthy and reduce the bad effects that the cancer treatment (chemotherapy, radiotherapy, transplant) may cause to the mouth (Souza, 2019; Kroetz; Czlusniak, 2003).

1 ASSESSMENT BY THE DENTIST BEFORE STARTING THE CANCER TREATMENT

As soon as the cancer is diagnosed, it is important that the child also be examined by other professionals: dentist, nutritionist, psychologist, social assistant, physical therapist, speech therapist, occupational therapist, pharmacist, and nurse (Instituto Nacional de Câncer; Instituto Ronald McDonald, 2011).





The dentist will talk to the parents and the child about the importance of oral health and daily care with dental hygiene; explain what may appear in the mouth after starting taking medications for cancer treatment (chemotherapeutic drugs), after radiotherapy and transplant; examine the child's whole mouth and identify teeth that need treatment, teeth with decay or inflamed gums; establish a follow-up throughout the cancer (oncologic) treatment, specific for each child, according to their needs (American Academy of Pediatric Dentistry, 2016; Farsi, 2016; Fonseca, 2004; Schubert et al., 1998).

Some children may have tooth decay when diagnosed with cancer, and the best time for the dentist to take care of their teeth is before the cancer treatment starts. However, sometimes, that is not possible because the treatment must start urgently. If that happens, the dentist will talk to the medical team to check the child's bloodwork and which medications they will be taking. Then, the doctors will decide when the child can do the treatment with the dentist (American Academy of Pediatric Dentistry, 2016; Farsi, 2016; Fonseca, 2004; Schubert et al., 1998).

Children using braces (orthodontic appliance) will be examined, and the team will discuss if there is a need to stop the orthodontic treatment and remove the appliance to avoid injuries in the mouth (American Academy of Pediatric Dentistry, 2016).

2 MOUTH HEALTH CARE DURING CANCER TREATMENT

During cancer (oncologic) treatment, the dentist will monitor the child to maintain mouth health, remind the patient of the importance of cleaning the teeth and tongue every day, and diagnose and treat the bad effects of the cancer medications that can affect the mouth (American Academy of Pediatric Dentistry, 2016).

2.1 Mucositis

The bad effects related to the cancer treatment depend, especially, on the location of the cancer, its severity, and the type of treatment that will be carried out.

Cancer treatment, whether it is chemotherapy or radiotherapy, does not attack cells with cancer only. It can also attack healthy cells. Thus, these bad effects can also affect the mouth, teeth, bones, and glands that produce saliva (Menezes et al., 2014; Santos et al., 2009).

The occurrence of wounds in the mouth (mucositis) is one of the significant bad effects of the therapy for cancer and directly impacts children's quality of life (Elad et al., 2020; Spezzia, 2020; Souza, 2019; Ritwik, 2018; Reolon et al., 2017; Ribeiro et al., 2017; Hanna et al., 2016; Elad et al. 2015; Cortes-Ramírez et al., 2014; Lalla et al., 2014; Menezes et al., 2014; Sasada et al., 2013; Epstein et al., 2012; Rampini et al., 2009; Rosenthal; Trotti, 2009; Santos et al., 2009; Cheng et al., 2008; Ribeiro et al., 2008; Vieira; Lopes, 2006; Barasch; Peterson, 2003; World Health Organization – WHO, 1979).

Mucositis is the consequence of a reaction caused by the drugs to treat cancer and by a type of radiation (radiotherapy) used as another form of therapy for cancer. Mucositis may appear in the mouth (mouth tissues), stomach and intestine (digestive tract) or where the child poops (anus) (Elad et al., 2020; Spezzia, 2020; Souza, 2019; Ritwik, 2018; Reolon et al., 2017; Ribeiro et al., 2017; Hanna et al., 2016; Elad et al. 2015; Cortes-Ramírez et al., 2014; Lalla et al., 2014; Menezes et al., 2014; Sasada et al., 2013; Epstein et al., 2012; Rampini et al., 2009; Rosenthal; Trotti, 2009; Santos et al., 2009; Cheng et al., 2008; Ribeiro et al., 2008; Vieira; Lopes, 2006; Barasch; Peterson, 2003; WHO, 1979).

The occurrence and the severity of the wounds in the mouth depend on various factors: the type of medication used to treat cancer, its doses, and the site of the therapy with radiation; if the mouth is well-cleaned; the food the child eats; and if the child drinks water, among other factors (Menezes et al., 2014; Sasada et al., 2013; Rosenthal; Trotti, 2009; Santos et al., 2009; Cheng et al., 2008; Barasch; Peterson, 2003).

Taking care of a child with mucositis is not easy. This care must be done by a team that includes a doctor, a dentist, a nurse, a nutritionist, a pharmacist, and a speech therapist. The dentist will identify if the child has mucositis and assess its severity. To identify if the child has mucositis, the dentist must carefully check the tongue, lips, cheeks, roof of the mouth, and throat.

Mucositis starts with a rash in the mouth, which may be in just one place or in the child's whole mouth. The child may feel their mouth more sensitive or sore. After that, there are wounds that look like a cold sore (ulcers), and they are very painful. The wounds can be a gateway for bacteria, fungi, or viruses (Elad et al., 2020; Souza, 2019; Ritwik, 2018; Ribeiro et al., 2017; Hanna et al., 2016; Elad et al. 2015; Cortes-Ramírez et al., 2014; Lalla et al., 2014; Menezes et al., 2014; Epstein et al., 2012; Santos et al., 2009; Ribeiro et al., 2008; Vieira; Lopes, 2006; WHO, 1979).

The dentist is also the professional in charge of preventing and treating mucositis. As prevention, the dentist will monitor the child from the beginning and during the treatment;

teach the child how to keep their mouth and teeth clean and their mouth hydrated. For some medications or for therapy that uses radiation in the head or neck, the dentist can use an appliance that has a light (laser), which helps reduce the occurrence of mucositis. Using the device that emits light to prevent mucositis does not hurt, and it is beneficial to the child. If children who undergo preventive laser therapy have mucositis, it will be milder (Elad et al., 2020; Spezzia, 2020; Souza, 2019; Ritwik, 2018; Reolon et al., 2017; Ribeiro et al., 2017; Hanna et al., 2016; Elad et al. 2015; Cortes-Ramírez et al., 2014; Lalla et al., 2014; Menezes et al., 2014; Sasada et al., 2013; Epstein et al., 2012; Rampini et al., 2009; Rosenthal; Trotti, 2009; Santos et al., 2009; Cheng et al., 2008; Ribeiro et al., 2008; Vieira; Lopes, 2006; Barasch; Peterson, 2003; WHO, 1979).

Moreover, the dentist can recommend therapy with ice (cryotherapy) to help prevent mucositis and refer the child to a nutritionist to adjust the diet. The child should avoid consuming acid food (orange, lime, pineapple), hard foods (popcorn), and dry foods; reduce the use of salt, and avoid ingesting strong condiments (spice, ketchup, mustard). Children with a healthy mouth and diet have lower chances of having mucositis (Elad et al., 2020; Spezzia, 2020; Souza, 2019; Ritwik, 2018; Reolon et al., 2017; Ribeiro et al., 2017; Hanna et al., 2016; Elad et al. 2015; Cortes-Ramírez et al., 2014; Lalla et al., 2014; Menezes et al., 2014; Sasada et al., 2013; Epstein et al., 2012; Rampini et al., 2009; Rosenthal; Trotti, 2009; Santos et al., 2009; Cheng et al., 2008; Ribeiro et al., 2008; Vieira; Lopes, 2006; Barasch; Peterson, 2003; WHO, 1979).

Mucositis usually starts between the 5th and 7th day after chemotherapy and in the second week after the beginning of radiotherapy. The treatment for mucositis is not a cookie-cutter approach- the child will be evaluated individually, and the treatment will be personalized. Each child responds differently to the treatment, and the clinical state of mucositis can take longer if their defense system is affected (neutropenia) (Elad et al., 2020; Spezzia, 2020; Souza, 2019; Ritwik, 2018; Reolon et al., 2017; Ribeiro et al., 2017; Hanna et al., 2016; Elad et al. 2015; Cortes-Ramírez et al., 2014; Lalla et al., 2014; Menezes et al., 2014; Sasada et al., 2013; Epstein et al., 2012; Rampini et al., 2009; Rosenthal; Trotti, 2009; Santos et al., 2009; Cheng et al., 2008; Ribeiro et al., 2008; Vieira; Lopes, 2006; Barasch; Peterson, 2003; WHO, 1979).

For children with an existing clinical state of mucositis, the dentist can prescribe medication to relieve the pain (painkillers), which will be defined individually. Besides, the dentist can use laser therapy, which is well-accepted by children because they notice the laser is not painful, but it is relieving, accelerates healing, and makes them better quickly. For some children, ice therapy (cryotherapy) can be used to bring relief (Elad et al., 2020; Spezzia, 2020; Souza, 2019; Ritwik, 2018; Reolon et al., 2017; Ribeiro et al., 2017; Hanna et al., 2016; Elad et al. 2015; Cortes-Ramírez et al., 2014; Lalla et al., 2014; Menezes et al., 2014; Sasada et al., 2013; Epstein et al., 2012; Rampini et al., 2009; Rosenthal; Trotti, 2009; Santos et al., 2009;

Cheng et al., 2008; Ribeiro et al., 2008; Vieira; Lopes, 2006; Barasch; Peterson, 2003; WHO, 1979).

2.2 Infections

Using drugs to treat cancer may reduce the capacity of the body to defend itself, and infections caused by bacteria, viruses, or fungi may occur. One of the most frequent infections by fungi is of the fungus Candida albicans, which causes an infection known as thrush (candidiasis). There are often white, raised, cottage cheese-like spots on the inner cheeks and the tongue. It may also occur at the corners of the mouth, causing a small wound or crack. In breastfed children, thrush may be present in the mouth of the toddler and the mother's breast. Candidiasis may cause pain and soreness (Neville, 2011).

The most frequent virus is called Herpes Simplex. When it occurs, there are wounds (lesions) on the tongue, lips, and gums, which can be augmented, very red, and painful. Because of that, the child can be very irritated, unwell, weak, and have difficulty eating (Neville, 2011).

The chances of developing diseases in the mouth caused by bacteria, viruses, or fungi increase if the child shares spoons, forks, knives, and cups with the caregiver or other children. The caregivers must avoid blowing food and kissing children in the mouth. If the child uses a pacifier or a bottle, they should be sanitized and well-stored. Remember that toddlers usually take objects to their mouth, so take care when sanitizing toys and other objects that the child usually plays with, especially teethers (Ministério da Saúde, 2019; Food Safety Authority of Ireland, 2012; Agência Nacional de Vigilância Sanitária, 2011; WHO, 2009, 2007).

Any disease in the mouth will be treated and followed up by the dentist, who will teach how to clean the mouth and the teeth and do a treatment with an appliance that has a light (laser). This treatment helps with faster healing and relieves the pain the child is feeling.

2.3 Altered sense of taste, hyposalivation, and dry mouth sensation

Remédios usados durante o tratamento do câncer (quimioterapia) ou a radioterapia podem provocar mudanças na capacidade de perceber o sabor dos alimentos (alteração do paladar), podem diminuir a quantidade de saliva na boca (hipossalivação) e, também, iniciar a sensação de boca seca (xerostomia) (Mosel et al., 2011; Hovan et al., 2010; Diaz-Arnold; Marek, 2002).

Para diminuir essas complicações é muito importante beber mais líquidos, inclusive durante as refeições; mastigar devagar para sentir mais o sabor dos alimentos e aumentar a quantidade de saliva; escovar os dentes todos os dias; usar enxaguantes bucais apenas se o dentista prescrever, porque ele irá escolher o mais indicado para a criança e também irá ensinar sobre os cuidados e a forma de usar; utilizar substitutos de saliva (saliva artificial), que podem ser prescritos pelo dentista; e pedir ajuda ao nutricionista para mudar a dieta (Mosel et al., 2011; Hovan et al., 2010; Diaz-Arnold; Marek, 2002).

2.4 Problemas que podem ocorrer na gengiva: gengiva inflamada ou saindo sangue

When tooth brushing is incorrect, residues of bacteria and food get stuck on the teeth and can inflame the gums. Caregivers can notice this when they brush or floss the child's teeth because the gums can be redder and bleed. This can be upsetting, cause pain, foul breath, and, if it gets worse, inflame the bone around the teeth. When the bloodwork is abnormal (a reduction in the platelets), there can be bleeding in the gums, which may or not be an inflammation (Guedes-Pinto, 2010; Kroetz; Czlusniak, 2003; Toledo, 1996).

2.5 Dry lips

Children with cancer can have drier lips, which can upset the child and lead to cuts (cracks) on the lips, bleeding, and wounds (Elad *et al*., 2020; Souza, 2019; Lalla *et al*., 2014).

It is fundamental to keep lips well hydrated with some lip moisturizer, which should be used many times during the day. It is helpful if the moisturizer has dexpanthenol or lanolin (this information can be found on the label). However, if the child has an allergy to any of

these products, the dentist must be communicated immediately. Colored lipsticks and cocoa butter do not have moisturizing properties. To avoid contamination, it is recommended to keep the lip moisturizer private, even with family members (Elad *et al*., 2020; Souza, 2019; Lalla *et al*., 2014).

2.6 Pain caused by some medications for treating cancer

Em alguns tipos de câncer o médico irá receitar medicações que se chamam vincristina e vimblastina. Algumas crianças, depois de tomarem esses remédios, podem sentir uma dor forte nos dentes, osso da boca e ao mastigar, mesmo se não tiverem cárie ou mucosite. Esta dor é passageira (transitória) e diminui ou desaparece depois que terminar o uso do remédio (American Academy of Pediatric Dentistry, 2016).

3 TAKING CARE OF THE HEALTH OF THE MOUTH (ORAL HEALTH)

Tooth brushing should start as soon as the first milk tooth appears, always using a toothbrush and toothpaste containing fluorine. Dental floss must be used every day and can start right after the second milk tooth appears. To keep the mouth and teeth healthy, brushing the teeth after each meal and before bed is fundamental. It is important to brush the teeth every day, even for children who do not eat through the mouth but through a tube dias (Jagher et al., 2016; Guedes-Pinto, 2010; Toledo, 1996).

The objective of tooth brushing is not only to remove residues of food that get stuck on the teeth after a meal and make the breath fresher but also to remove bacteria that feed from the residues of food that get stuck in the tooth and may cause problems such as decay, inflammation of the gums (gingivitis), and pain (Guedes-Pinto, 2010; Toledo, 1996).

Children cannot brush their own teeth before they are eight years old, so tooth brushing for them must be done by an adult. After they are eight years old, the child can start brushing their teeth on their own, but it is essential that there is an adult to supervise them, especially at night, and help them if there is any difficulty (Guedes-Pinto, 2010; Toledo, 1996).

Some very young children demonstrate some resistance to tooth brushing and express it by crying and taking the brush out of their mouth. They do not understand the importance of brushing their teeth and show their emotions through crying. Despite this difficulty, it is fundamental that the parents stay firm and insist on brushing, embrace the child, and try to make this moment fun. Tooth brushing is the better and primary way of keeping the teeth healthy (Guedes-Pinto, 2010; Toledo, 1996).

Children understand something better when they see their parents doing it; thus, it is helpful that children see their parents brushing their teeth and flossing so they will slowly feel like imitating them (Guedes-Pinto, 2010; Toledo, 1996).

Toothbrushing time can be fun. Take this moment to sing, tell stories, and let the child brush the teeth of a toy they really like to get used to brushing their own teeth (Guedes-Pinto, 2010; Toledo, 1996).

3.1 The toothbrush

For the brushing to be done correctly, each person in the family must have their own toothbrush. The child's toothbrush must be small with soft or extra-soft bristles (this information can be found on the top of the brush packaging) (Guedes-Pinto, 2010; Toledo, 1996).

After each brushing, the toothbrush must be softly washed with clean water. After washing it, it must be put in an open container with the handle down. The bristles of the brush should not be covered because the air must dry them (American Dental Association, 2011; Toledo, 1996).

Since the child with cancer may have low defense capacity (low immunity), their toothbrush must be stored in a separate container from the others in the home, to avoid contamination. The container must be kept away from the toilet (American Dental Association, 2011; Toledo, 1996).

The toothbrush must be changed every three months, at least. If the child gets sick or the toothbrush bristles are worn out or deformed, it must be thrown away (American Dental Association, 2011; Toledo, 1996).

3.2 The toothpaste

The toothpaste must contain fluorine in its formulation. Fluorine is vital to make teeth stronger and avoid the occurrence of stains and holes in the teeth, which we call cavities. Cavity is the main oral disease that affects children and can result in serious consequences such as pain and loss of the tooth (Jagher et al., 2016; Chaves; Vieira-da-Silva, 2002; Cury, 2002, 1989).

Even if the child has temporary teeth, which are called milk teeth, they must be very carefully taken care of because they are important to the growth of the child's mouth, to save space for adult teeth (permanent), and to guarantee a beautiful smile (Guedes-Pinto, 2010; Toledo, 1996).

The recommended amount of fluorine in the toothpaste is at least 1,100 parts per million of fluorine (1,100 ppm of fluorine) (this information can be found on the paste tube). Pastes without fluorine or less than 1,100 ppm of fluorine must not be used (Jagher et al., 2016; Chaves; Vieira-da-Silva, 2002; Cury, 2002, 1989).

Spreading the paste on the toothbrush must always be done by an adult, in a very small amount recommended by the dentist. The recommended amount of toothpaste for each age is in the table below (Jagher et al., 2016; Chaves; Vieira-da-Silva, 2002; Cury, 2002, 1989):

Children from 0 to 2 years old	Amount: ½ grain of uncooked rice
Children from 2 to 5 years old	Amount: 1 grain of uncooked rice
Children over 6, teenagers and adults	Amount: one pea
Never	Fill the whole brush

There is a substance in some kinds of toothpaste that can give it a burning sensation and irritate more sensitive mouths. The name of this substance is Sodium Lauryl Sulfate, which is a detergent that cleans the teeth. It is better to buy toothpaste without this substance (this information can be found on the paste tube) (Kroetz; Czlusniak, 2003).

3.3 Dental floss

Dental floss cleans parts of the teeth the brush cannot reach, i.e., between the teeth. It must be used every day, once a day, especially before going to bed. All teeth must always be carefully flossed before brushing. Dental floss can be regular (tread or tape) or with a plastic handle, which makes it easier for the parents to hold when flossing their child's teeth. Floss that has already been used must be discarded after use (Guedes-Pinto, 2010; Toledo, 1996).

Older children cannot floss on their own, so they need training. Older children must always floss in front of a mirror, where they can better see their teeth. The toothpick does not substitute dental floss and should not be used because it may hurt the gums, causing pain and bleeding (Guedes-Pinto, 2010; Toledo, 1996).

3.4 Brushing technique

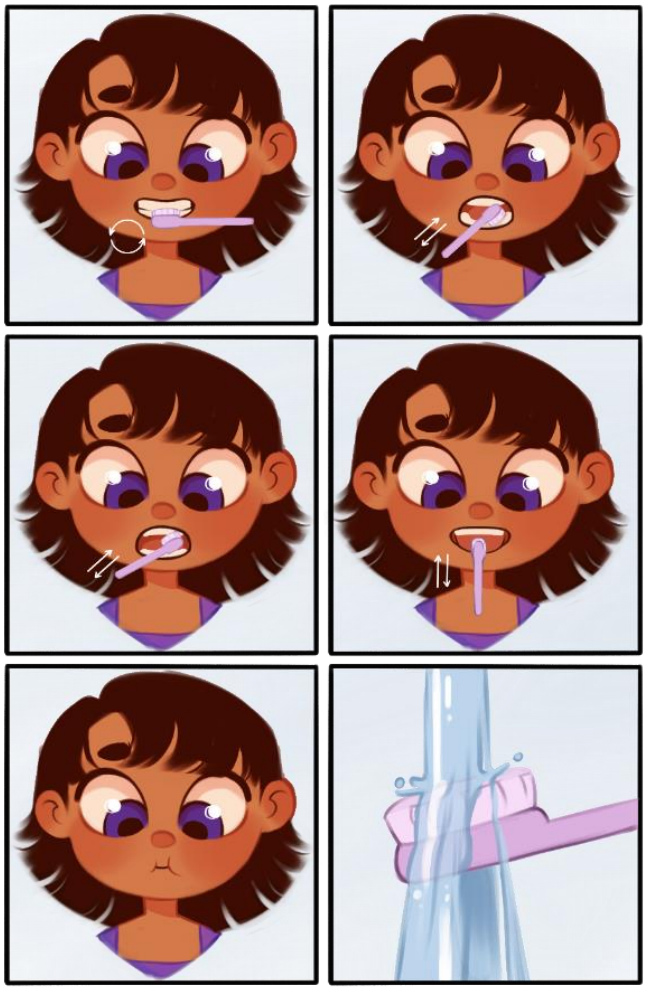
There are many ways of correctly brushing your teeth. The best way is the one the family and the child adapt to. Very young children are better positioned when lying down, but it is essential to keep the head slightly elevated in relation to the body to avoid choking. Brushing is easier with the help of two adults: one helps with the child's position while the other does the brushing (Guedes-Pinto, 2010; Toledo, 1996).

Depending on how comfortable the child and the family feel, older children can be positioned sitting or lying down (always elevating the head) (Guedes-Pinto, 2010; Toledo, 1996).

For children who can already brush their teeth on their own and under the supervision of an adult, it is fundamental to be in front of a mirror to see their mouth and teeth better (Guedes-Pinto, 2010; Toledo, 1996).

When the child is well positioned, the adult will put the paste on the toothbrush and brush the child's teeth or give them the toothbrush to brush their teeth on their own. In tooth brushing, all teeth must be brushed, giving special attention to each part of the tooth, making ball (circular), train (back-and-forth), and broom movements, sweeping the dust out of the teeth. It is also fundamental to brush the tongue (Guedes-Pinto, 2010; Toledo, 1996).

1. Ball: begin brushing by making smooth circular movements in the front and the back side of all teeth, in both the upper and lower parts of the mouth.
2. Train: make smooth movements back-and-forth in the back teeth, up and down in the mouth.
3. Broom: make smooth sweeping movements in the front and back of the teeth, from the top to the bottom.
4. Brush the tongue with a back-and-forth movement.
5. Rinse the mouth, wash the brush in running water, and keep the brush with the handle down in an open container.



REFERENCES

Agência Nacional de Vigilância Sanitária. Resolução - RDC nº 44, de 19 de setembro de 2011. Regulamento técnico para fórmulas infantis de seguimento para lactentes e crianças de primeira infância. Brasília 2011 [cited 2023 Sep 12]. Available from: https://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2011/res0044_19_09_2011.html

American Academy of Pediatric Dentistry. Guideline on Dental Management of Pediatric Patients Receiving Chemotherapy, Hematopoietic Cell Transplantation, and/or Radiation Therapy. Pediatr Dent. 2016 Oct;38(6):334-342.

American Dental Association, Council on Scientific Affairs. Toothbrush care: cleaning, storing and replacement. November, 2011 [cited 2023 Sep 12]. Available from: https://www.expressions-dental.com/storage/app/media/toothbrush-care-article-for-website.pdf

Barasch A, Peterson DE. Risk factors for ulcerative oral mucositis in cancer patients: unanswered questions. Oral Oncol. 2003 Feb;39(2):91-100. doi: 10.1016/s1368-8375(02)00033-7

Chaves SCL, Vieira-da-Silva LM. A efetividade do dentifrício fluoretado no controle da cárie dental: uma meta-análise. Rev Saúde Pública. 2002;36(5):598-606. DOI: https://doi.org/10.1590/S0034-89102002000600009

Cheng KK, Goggins WB, Lee VW, Thompson DR. Risk factors for oral mucositis in children undergoing chemotherapy: a matched case-control study. Oral Oncol. 2008 Nov;44(11):1019-25. doi: 10.1016/j.oraloncology.2008.01.003.

Cortes-Ramírez J, Ayala C, Cortes J, Cortes R, Salazar L, Castelo O, de la Torre M. Oral alterations in children with cancer. Literature review. J Oral Res. 2014;3(4):262-268.

Cury JA. Dentifrícios fluoretados no Brasil. RGO (Porto Alegre). 1989;37(2):139-42.

Cury JA. Dentifrícios: como escolher e como indicar. In: Associação Paulista dos Cirurgiões-Dentistas. Odontologia. São Paulo: Artes Médicas – Divisão Odontológica; 2002 [cited 2023 Sep 12]. p. 281-295. Available from: https://edisciplinas.usp.br/pluginfile.php/3116118/mod_resource/content/1/Prevencao-CURY%20J_A_%20Dentifricios%20como%20escolher%20e%20como%20indicar.pdf

Diaz-Arnold AM, Marek CA. The impact of saliva on patient care: A literature review. J Prosthet Dent. 2002 Sep;88(3):337-43. doi: 10.1067/mpr.2002.128176.

Elad S, Cheng KKF, Lalla RV, Yarom N, Hong C, Logan RM, et al. MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. Cancer. 2020 Oct 1;126(19):4423-4431. doi: 10.1002/cncr.33100

Elad S, Raber-Durlacher JE, Brennan MT, Saunders DP, Mank AP, Zadik Y, et al. Basic oral care for hematology-oncology patients and hematopoietic stem cell transplantation recipients: a position paper from the joint task force of the Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology (MASCC/ISOO) and the European Society for Blood and Marrow Transplantation (EBMT). Support Care Cancer. 2015 Jan;23(1):223-36. doi: 10.1007/s00520-014-2378-x

Epstein JB, Thariat J, Bensadoun RJ, Barasch A, Murphy BA, Kolnick L, Popplewell L, Maghami E. Oral complications of cancer and cancer therapy: from cancer treatment to survivorship. CA Cancer J Clin. 2012 Nov-Dec;62(6):400-22. doi: 10.3322/caac.21157.

Farsi DJ. Children undergoing chemotherapy: is it too late for dental rehabilitation? J Clin Pediatr Dent. 2016;40(6):503-505. doi: 10.17796/1053-4628-40.6.503

Fonseca MA. Dental care of the pediatric cancer patient. Pediatr Dent. 2004 Jan-Feb;26(1):53-7.

Food Safety Authority of Ireland. Guidance Note nº 22 information relevant to the development of guidance material for the safe feeding of reconstituted powdered infant formula (Revision 2). Dublin: FSAI; 2012.

Guedes-Pinto AC. Odontopediatria. São Paulo: Livraria Santos; 2010.

Hanna LMO, Botti MTSR, Araújo RJG, Damasceno JM, Mayhew ASB, Andrade Filho GG. Oral manifestations and salivary pH changes in children undergoing antineoplastic therapy. Pesqui

Bras Odontopediatria Clin Integr. 2016;16(1):403-410. DOI: http://dx.doi.org/10.4034/PBOCI.2016.161.42

Hovan AJ, Williams PM, Stevenson-Moore P, Wahlin YB, Ohrn KE, Elting LS, et al. A systematic review of dysgeusia induced by cancer therapies. Support Care Cancer. 2010 Aug;18(8):1081-7. doi: 10.1007/s00520-010-0902-1.

Instituto Nacional de Câncer (Brasil), Instituto Ronald McDonald. Diagnóstico precoce do câncer na criança e no adolescente. 2. ed. rev. ampl. Rio de Janeiro: Inca; 2011.

Jagher AC, Ripplinger T, Pinto GS, Schardosim LR. Avaliação da utilização de dentifrício fluoretado em crianças. RFO UPF. 2016;21(1):37-42. DOI: https://doi.org/10.5335/rfo.v21i1.5464

Kroetz FM, Czlusniak GD. Alterações bucais e condutas terapêuticas em pacientes infanto-juvenis submetidos a tratamentos anti-neoplásicos. Publ UEPG Biol Health Sci. 2003;9(2):41-48. DOI: https://doi.org/10.5212/publicatio%20uepg.v9i2.363

Lalla RV, Bowen J, Barasch A, Elting L, Epstein J, Keefe DM, et al. MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. Cancer. 2014 May 15;120(10):1453-61. doi: 10.1002/cncr.28592. Erratum in: Cancer. 2015 Apr 15;121(8):1339.

Menezes ACS, Rosmaninho E, Raposo BS, Alencar MJS. Abordagem clínica e terapêutica da mucosite oral induzida por radioterapia e quimioterapia em pacientes com câncer. RBO. 2014;71(1):35-38.

Ministério da Saúde (BR), Secretaria de Atenção Primaria à Saúde, Departamento de Promoção da Saúde. Guia alimentar para crianças brasileiras menores de 2 anos. Brasília: Ministério da Saúde; 2019.

Mosel DD, Bauer RL, Lynch DP, Hwang ST. Oral complications in the treatment of cancer patients. Oral Dis. 2011 Sep;17(6):550-9. doi: 10.1111/j.1601-0825.2011.01788.x.

Neville B. Patologia oral e maxilofacial. Rio de Janeiro: Elsevier; 2011.

Rampini MP, Ferreira EMS, Ferreira CG, Antunes HS. Utilização da terapia com laser de baixa potência para prevenção de mucosite oral: revisão de literatura. Rev Bras Cancerol. [Internet]. 2009 [citado 2023 set. 12];55(1):59-68. Disponível em: https://rbc.inca.gov.br/index.php/revista/article/view/1679

Reolon LZ, Rigo L, Conto F, Cé LC. Impacto da laserterapia na qualidade de vida de pacientes oncológicos portadores de mucosite oral. Rev Odontol UNESP. 2017;46(1):19-27.

Ribeiro ILA, Limeira RRT, Dias de Castro R, Ferreti Bonan PR, Valença AMG. Oral Mucositis in Pediatric Patients in Treatment for Acute Lymphoblastic Leukemia. Int J Environ Res Public Health. 2017 Nov 28;14(12):1468. doi: 10.3390/ijerph14121468.

Ribeiro RA, Leitão RFC, Sant'ana RO, Moura JFB, Lima V, Medeiros RP, et al. Mucosite oral: patogênese e manuseio clínico. Rev Bras Oncol Clín. 2008;5(15):18-24.

Ritwik P. Dental care for patients with childhood cancers. Ochsner J. 2018 Winter;18(4):351-357. doi: 10.31486/toj.18.0061.

Rosenthal DI, Trotti A. Strategies for managing radiation-induced mucositis in head and neck cancer. Semin Radiat Oncol. 2009 Jan;19(1):29-34. doi: 10.1016/j.semradonc.2008.09.006.

Santos PSS, Messaggi AC, Mantesso A, Magalhães MHCG. Mucosite oral: perspectivas atuais na prevenção e tratamento. RGO. 2009;57(3):339-344.

Sasada INV, Munerato MC, Gregianin LJ. Mucosite oral em crianças com câncer-revisão de literatura. RFO (Passo Fundo). 2013;18(3):345-350. DOI: https://doi.org/10.5335/rfo.v18i3.3338

Schubert MM, Epstein JB, Peterson DE. Oral complications of cancer therapy. In: Yagiela JA, Neidle EA, Dowd FJ, editors. Pharmacology and Therapeutics for Dentistry. 4th ed. St. Louis: Mosby; 1998. p. 644-655.

Souza RCC. Odontologia especial pediátrica: correlação prática e evidências. São Paulo: Quintessence Editora; 2019.

Spezzia S. Mucosite oral em pacientes cancerosos submetidos a tratamento quimioterápico. Rev Ciênc Odontol. 2020;4(1):36-40.

Toledo OA. Odontopediatria: fundamentos para a prática clínica. São Paulo: Premier; 1996. 344 p.

Vieira ACF, Lopes FF. Mucosite oral: efeito adverso da terapia antineoplásica. 2006. Rev Ciênc Méd Biol. 2006;5(3):268-274. DOI: https://doi.org/10.9771/cmbio.v5i3.4135

World Health Organization. Handbook for reporting results of cancer treatment. Geneva: World Health Organization; 1979.

World Health Organization. WHO guidelines on hand hygiene in health care. Geneva: WHO; 2009.

World Health Organization; Food and Agriculture Organization of the United Nations. Safe preparation, storage and handling of powdered infant formula: guidelines. Geneva: World Health Organization; 2007.

Storage of Medications

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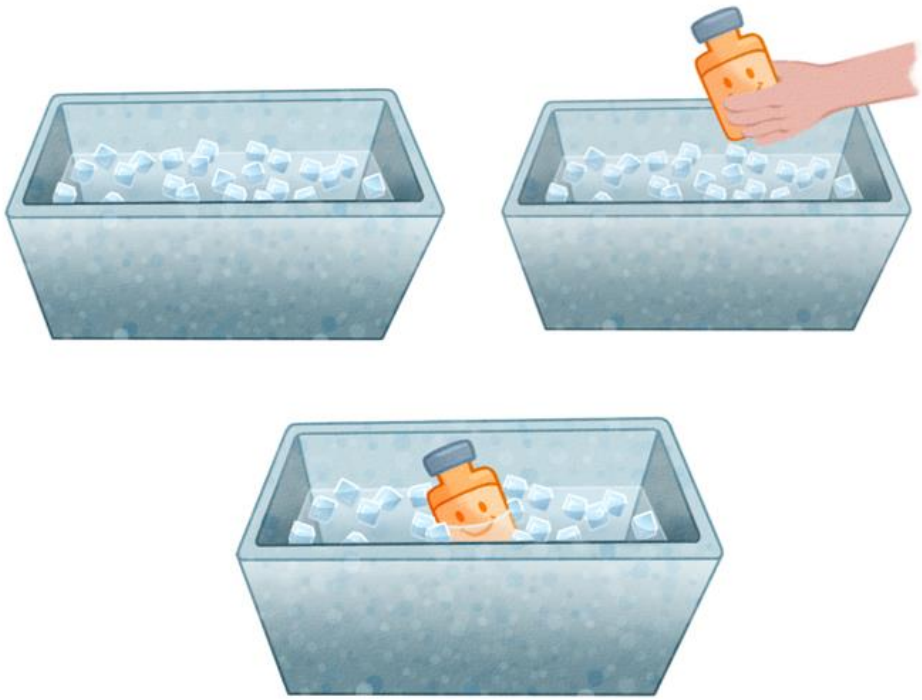
Carolina Ferreira Tiago

The medication must be stored in its original packaging, in a safe place away from children and animals, cleaning products, perfume, and food, and protected from light, humidity, and heat. Do not store it in a cabinet in the bathroom, on the fridge, or the microwave because the temperature change may spoil the medication (Ministério da Saúde, 2017; Universidade Federal de Minas Gerais, 2021).

Some medications must be stored in the fridge if instructed in the package or leaflet. Some instructions must be followed (Ministério da Saúde, 2017):

- The transportation of the medication must be refrigerated from the hospital to your home in a styrofoam box with ice or *gelox*.

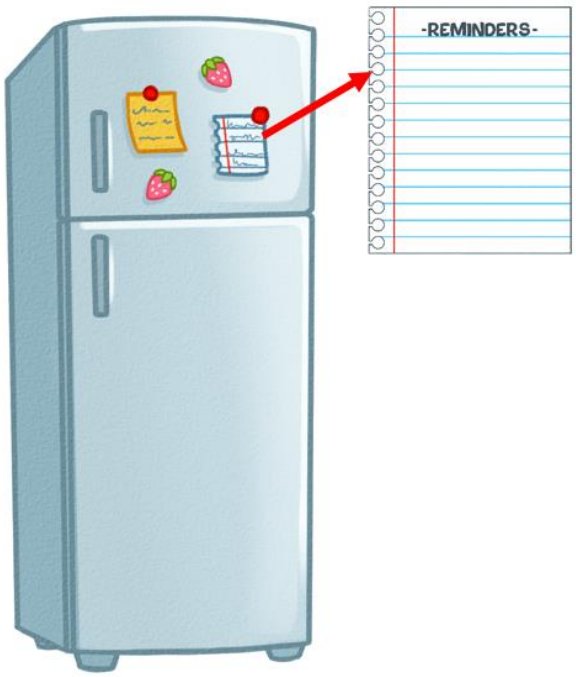


- When you get home, take the medication out of the styrofoam box and put it on a shelf in the fridge with a tag saying, "**Warning! Medication for cancer treatment."** This is important so we do not run the risk of another person taking the medication.

- The styrofoam box must not be put in the fridge because it isolates the temperature and does not let cold air refrigerate the medication, even if the lid is open. It compromises the effect of the drug. The styrofoam box is used for transportation only and must be cleaned with soap and water or sanitizer after every use.

- Do not leave the medication near the fridge or on the fridge door.
- Do not “cover” the shelves in the fridge with plastic or tissue because it hinders the flow of cold air that refrigerates the medication.

- In case of a power outage at home, avoid opening the fridge so the cold air inside the refrigerator does not “escape.” If the blackout takes too long, use the styrofoam box with ice to conserve the medication.



Always read the leaflet that comes in the box of the medications to check the best place to store the medicine.

REFERENCES

Ministério da Saúde (BR). Promoção da Saúde. Saiba como usar e armazenar corretamente os medicamentos. Blog da Saúde, 2017 [citado 2021 abr. 8]. Disponível em: http://www.blog.saude.gov.br/index.php/promocao-da-saude/52435-saiba-como-usar-e-armazenar-corretamente-os-medicamentos

Universidade Federal de Minas Gerais, Faculdade de Farmácia, Centro de Estudos do Medicamento. Onde guardar os medicamentos? [Internet; citado 2021 abr. 8]. Disponível em: https://www.farmacia.ufmg.br/onde-guardar-medicamentos/

Nursing Care: professional

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All the professionals working in the healthcare network in hospitals, health centers, clinics, or emergency units, are essential in caring for children/teenagers with cancer. In this chapter, you will understand better how nursing professionals can help on the Journey to a safer and smoother treatment.

Nursing plays a fundamental role in the treatment of a hospitalized child with cancer and in supporting family because they work directly in administering medications and monitoring patients' daily routines. Thus, due to this proximity, these professionals can help guide and clarify doubts that patients and caregivers may have regarding the disease and the treatment (Instituto Nacional de Câncer – INCA, 2008).

1 NURSING CARE DURING HOSPITALIZATION

Nursing cares with the hospitalized child or teenager for cancer treatment can be divided, in short, into (1) personal care and (2) care related to medications. Besides directly participating in the care, nursing professionals can guide the patient's caregivers, so they are also aware of personal care and care with medications.

As for personal care, the caregiver must pay attention to directions given by the nurses about hygiene, which includes using the bathroom and brushing the teeth. As for care with medications, the caregiver also must pay attention to the nurses' directions about the medications the patient is using, especially about the unwanted effects and changes that might happen during and/or after their use. Thus, as the caregiver is close to the child or teenager most of the time in the hospital, they can help nurses with this care in addition to being wary of any odd signs the patient may develop due to the use of medication so that they can report uncommon or unwanted situations (INCA, 2008).

Hand washing

Brushing teeth

Below you can see some situations or information the caregiver should report to nursing if they observe something during the period of the child's/teenager's hospitalization.

ATTENTION TO SITUATIONS THAT SHOULD BE REPORTED TO NURSING

1. Inform nursing about bad reactions observed in the child/teenager after medication use. Some of these reactions after using chemotherapeutic drugs may have immediate or late effects, and even in the case of known effects, they must always be reported to nursing. Examples of immediate bad reactions a few hours after use of the medication are wounds where the chemotherapeutic drug is administered, headache or skin allergy (itching and/or rash all over the body or in the place where the drug was administered), shivering, fever, nausea, dizziness, feeling faint. As for late harmful effects, there may be all-the-time tiredness, fast weight loss, nausea, and vomiting- The caregiver must always immediately call nursing as soon as they notice any alteration or change in the clinical conditions of the child/teenager under treatment. Another vital information the caregiver must report to the nursing team is if the child shows difficulty breathing because it might mean a more severe allergy (Resende, 2017; Giavina-Bianch, 2018; Sales et al., 2012).

Weight loss

Tiredness

Rash

Wound on the skin

Headache

Dizziness

Allergy

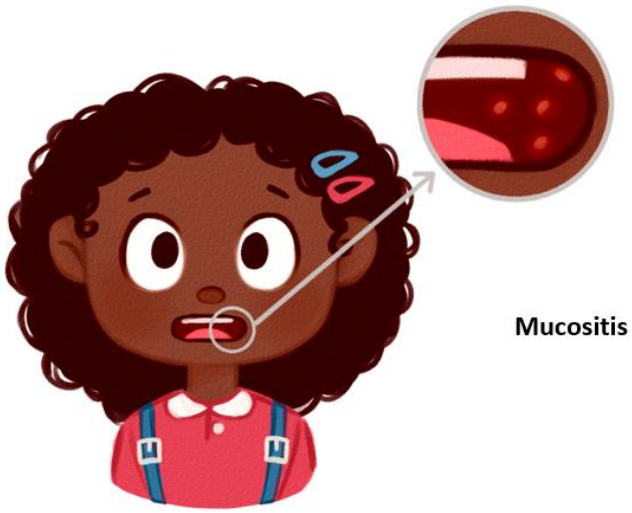
Chill

Fever

Difficulty breathing

Feeling faint

2. The caregiver must also inform if the child/teenager has been having difficulty taking the medications because of a bad reaction they might be feeling, for example. Non-adherence, that is, not taking the drug or taking it wrongly, may hinder the child's/teenager's treatment and interfere with the result and its total cure (INCA, 2008).
3. The caregiver must also inform if they have any questions about the disease, the necessary care, and the protocol of the child's/teenager's treatment. This is essential information, and the caregiver must be informed of all aspects of the treatment, which includes written information regarding bad reactions the chemotherapeutic drug may cause for many years (INCA, 2008).
4. Inform if the child is eating well, if they have any difficulty swallowing if they are urinating enough, or if the urine is foamy. It is also essential to observe the color of the poo, if it looks hard or soft, and if the child shows any diarrhea or constipation (INCA, 2008; Marques et al., 2015).
5. Inform if the child has any wound in the mouth or digestive system (the injuries might indicate a case of mucositis, which requires assistance from the health team) (Marques et al., 2015).



Mucositis

Nursing may instruct the caregiver to write a report of the child's/teenager's signs and symptoms, possible alterations, and questions that have arisen so that nothing goes unnoticed.

2 PRECAUTIONS IN THE BATHROOM

The caregiver often stays in the hospital with the child or teenager. Thus, some precautions are essential before, during, and after showering, including the common bathroom use for the caregiver and the patient (Marques et al., 2015; Universidade Federal de Minas Gerais, [2013?]).

In the case of the patient who has been using chemotherapeutic drugs, there is a need for closer attention to showering. At this moment, it is essential to follow an order for cleaning: wash (1) hands, (2) face, (3) head, (4) belly, (5) back, (6) arms, (7) legs and, if the child has a catheter, it should be the last item to be cleaned, being careful to avoid contamination (Marques et al., 2015; Universidade Federal de Minas Gerais, [2013?]).

Besides, it is essential to be careful with the bathroom used by this child/teenager on the day the chemotherapeutic drug is administered and on the two subsequent days. After using the toilet, one must flush three times with the lid down, and the toilet must be cleaned from the inside out, ending the cleaning with bleach. If the caregiver is responsible for changing the child's/teenager's diapers, it is necessary to use gloves and disposable materials. All the contaminated materials must be disposed of into two plastic bags, which must be tightly closed (Marques et al., 2015; Universidade Federal de Minas Gerais, [2013?]).

3 PRECAUTIONS WITH THE MEDICATIONS

3.1 Medications administered through a tube

Child with tube

Many times, oncologic patients are unable to swallow solid particles (such as medications and food) and need to take the medication through a tube. The tube enters through the mouth or the nose and takes the medication in liquid form to the stomach or intestine. Some extra care must be taken with patients that need to use the drugs through the tube (Moreira et al., 2004; Ministério da Saúde (BR), 2002).

It is essential to pay attention to cases in which the patient is using the tube for feeding and need to administer medication simultaneously through the same tube. In this case, the health team will check the compatibility of the drug and the food administered via tube (nutrients of enteral nutrition) to change the time for medication intake if the effect of the medication is decreased because of the food (Moreira et al., 2004; Ministério da Saúde (BR), 2002).

When the medication cannot be administered with food, the health professionals will adapt the times and procedures so that the patient gets the drug and the food through the tube safely, as described below. Feeding may be interrupted for two hours so that the medication can be administered without getting in contact with this food. Another critical point is the attention that should be given to cleaning the tube. For cleaning the tube and also keeping it from getting blocked (obstructed), it is essential that the nurse washes the inside of the tube with a syringe containing 15 to 30ml of tepid water. This step is made before and after administering the medication, to remove any residue of the food or medicine that may have gotten stuck in the tube (Moreira et al., 2004; Ministério da Saúde (BR), 2002; Williams, 2008).

When more than one medication needs to go through the tube simultaneously, cleaning must be compulsory between the administration of both drugs with 5 to 10 mL of tepid water (Williams, 2008). When there is a blockage (obstruction) of the tube, it is necessary to use 50mL of tepid water. In this case, there should be attention to the speed applied to the plunger not to damage the tube. If the blockage (obstruction) continues, the tube should be washed with carbonated water or alkaline solution (Gharib et al., 1996).

The health team needs to pay attention to the characteristics of the drug (such as PH and viscosity), for they are factors related to the formation of a solid part (precipitation) in the tube, which would be one reason for the blockage (obstruction). Besides, another point for attention is the concentration (osmolarity) because drugs with high concentration administered through a tube may cause diarrhea and colic in the patient. So, when it comes to a liquid formulation, many aspects must be observed on administration through a line, even if, apparently, it does not do any harm (Moreira et al., 2004; Ministério da Saúde (BR), 2002).

Table 1. Medicines that cannot be used through a tube

ATTENTION TO SOME PILLS* THAT SHOULD NOT BE TAKEN VIA TUBE		
Albendazole	Vitamin B Complex (Multivitamin)	Nifedipine
Amoxicilin + Clavulanate	Dexclorfeniramine	Sulfamethoxazole +Trimethroprim
Azithromycin	Dimehydrinate + Pyridoxine	Ferrous Sulfate
Calcitriol	Isosorbid	Temozolamide
Cephalexin	Levetiracetam	Mineral Oil*
Ciclosporin	Mercaptopurine	
Potassium Chloride	Mycophenolate Mofetil	

Source: White and Bradnam (2007).

Precaution with bleedings and purple spots throughout the child's body:

- Avoid medicines and teas made with plants.
- Avoid unprescribed medicines.
- Brush teeth smoothly using very soft toothbrushes.
- Wear shoes even inside the home.
- Be careful with sharp and edgy objects within the reach of the child.
- Use moisturizers for the skin and mouth to prevent cracking and dryness.
- Avoid plays, games and exercises which can cause bumping, stumbling or hitting the body.
- Do not pull the scabs of any injury.
- Do not pop the pimples.
- If your daughter has a period, ask the doctor to prescribe a highly absorbing pad.
- If there is gum bleeding, rinse the mouth with cold water or suck ice chips.
- If the nose bleeds, press one nostril at a time and block it for 5 to 10 minutes.
- If any other part of the body bleeds, press the wound with a tissue until the bleeding stops.
- Put some ice on the purple spots that appear.
- Seek medical assistance as soon as possible (ST. Jude Children's Research Hospital, 2024).

3.2 Medications sensitive to light (photosensitivity)

Some medications do not like light, i.e., they are sensitive to light and called photosensitive, and need protection to avoid their action being reduced because of light. Drugs sensitive to light need special care with storage, handling, and administration. Due to this characteristic, the bottles of some medications are of a dark color, so are colored and frosted bags and tubes to keep the light from reaching the drug and making it bad (unfit) for treatment (Greenhill; McLelland, 1990).

If a photosensitive medication gets in contact with light, it might suffer alterations visible or not to the naked eye. Among the alterations that can be seen are changes in color, consistency, or even in the formation of a solid part (precipitation) in water (solution). The alterations, be they visible or not, may mean loss in action (activity) of the medicine or the formation of substances (compounds) that may cause bad reactions (adverse effects) to the child/teenager (Greenhill; McLelland, 1990).

See below some medications used to treat cancer that need protection from the light (Greenhill; McLelland, 1990).

Table 2. Photosensitive chemotherapy drugs

ATTENTION TO PHOTOSENSITIVE MEDICATIONS		
Alemtuzumab	Bevacizumab	Carboplatin CBDCA
Carmustine BCNU	Cisplatin CDDP	Cytarabine ARA-C
Cladribine 2-CDA	Dacarbazine DTIC	Dactinomycin DACT
Daunorubicin DAUNO	Dexrazoxane	Doxorubicin ADRIA
Fluorouracil-5-FU	Idarubicin IDR	Irinotecan CPT-11
Methotrexate MTX	Mercaptopurine 6-MP	Mitoxantrone DHAQ
Nimotuzumab	Rituximab	Tioguanine 6-TG
Vinblastine VLB	Vincristine VCR	Vinorelbine

Source: Greenhill and McLelland (1990).

3.3 Patient's sensitivity to light in the use of chemotherapeutic drugs

Some drugs to treat cancer may leave the skin more sensitive to sunlight and result in bad reactions (Monteiro et al., 2016). These reactions happen because the light penetrates the body through the skin and gets in contact with substances (particles) of the medication, which may circulate throughout the blood vessels or deposit in the skin. Thus, the medication, when in contact with the light, may go through changes or generate new molecules (Greenhill; McLelland, 1990).

The bad reactions (photosensitivity) may happen because of the interaction between light and the medication in the child's/teenager's body, and they can be of two types: allergy to sunlight (photoallergic) or toxic under sunlight (phototoxic).

Photoallergic reactions generally involve the child's/teenager's defense system (immunologic), which identifies these new substances as dangerous to the body, generating an allergy. This allergic reaction usually goes away when the drug administration is interrupted. Phototoxic reactions are more common and happen because of the direct action of these new substances in the child's/teenager's body (Greenhill; McLelland, 1990; Monteiro et al., 2016).

When the child/teenager is exposed to sunlight for a long time, when sunlight is stronger (higher incidence of the sun), the cancer medicine may generate a reaction in the skin. Thus, there are burns and inflammation of the skin (eczema) (Monteiro et al., 2016; Drucker; Rosen, 2011). These wounds are generally visible in regions with more contact with light, such as the face, neck, forearms, and hands. It is essential that nursing knows about any skin lesion in the child/teenager so that a proper physical exam is made and to know if these wounds were caused by sunlight (Drucker; Rosen, 2011).

Since not all patients can interrupt the use of the drugs when a bad reaction is identified, some precautions during treatment can help in cases of sunlight exposure. Among these measures are: avoiding overexposure to sunlight in peak hours, using clothes that protect against sunlight, and wearing sunscreen against the sun's ultraviolet radiation (UVA and UVB) (Monteiro et al., 2016; Drucker; Rosen, 2011).

The Brazilian Society of Dermatology recommends using sunscreen with Solar Protection Factor (SPF), which is informed on the product's label, above 30, and protection against UVA radiation (Schalka; Steiner, 2014). Ideally, the sunscreen should be applied every 2 (two) hours following the "Teaspoon Rule." The idea behind this rule is that the ideal amount of sunscreen is around a teaspoon: one teaspoon for the face and head, one teaspoon for each arm, two teaspoons for each leg, and two teaspoons for the trunk (Schalka; Steiner, 2014).

It is also essential to avoid the child/teenager being exposed to sunlight if the shade is smaller than their height. Exposure to sunlight should be avoided between 10 (ten) in the morning and 3 (three) in the afternoon. Clothes that better cover the body and hats are helpful

for protection. Parasols can also help make shade – the darker and thicker the tissue of the parasol, the better (Schalka; Steiner, 2014).

Sun protection

3.4 Medicine extravasation: leakage of intravenous drugs into other parts of the body

Child with a tube and the medication leaking

Extravasation happens when the liquid, fluid, or medication accidentally goes out of the vein into surrounding tissues. This situation occurs mainly because of the incorrect

position of the venous catheter (the device inserted through a vein) or the rupture of a vein during drug administration (Giavina-Bianch, 2018; Corbett et al., 2018; Melo et al., 2020; Silva et al., 2018; Kreidieh et al., 2016; Souza et al., 2017). Extravasation can be considered an emergency since it can cause pain, inflammation, burning, and tissue death (local necrosis). Besides, some chemotherapeutic drugs can cause a lesion instantly (immediate) or after a while (late), which may hinder the recovery of the skin (scarring) (Giavina-Bianch, 2018; Corbett et al., 2018; Melo et al., 2020; Silva et al., 2018; Kreidieh et al., 2016; Souza et al., 2017).

When the extravasation is treated at the beginning, it prevents more serious problems for the child/teenager, such as reducing the patient's recovery time (Giavina-Bianch, 2018; Corbett et al., 2018; Melo et al., 2020; Silva et al., 2018; Kreidieh et al., 2016; Souza et al., 2017). Thus, when there is extravasation or its suspected occurrence, it is necessary to ask nursing for help immediately so that they can initiate the care protocol in case of extravasation. Complications from extravasation will depend on the patient's characteristics, the equipment used, the type of medication, and the nursing team's action (Giavina-Bianch, 2018; Corbett et al., 2018; Melo et al., 2020; Silva et al., 2018; Kreidieh et al., 2016; Souza et al., 2017). As for the kind of medication, attention must be given to whether it is considered vesicant or irritant, as described below.

3.4.1 What are irritant and vesicant medications?

The bad reactions caused by the extravasation depend on the kind of drug for cancer treatment being injected into the vein. For that matter, medications can be divided into three groups: vesicant, irritant, and non-irritant/vesicant. The vesicant medicines, on the other hand, are divided into DNA ligands (the molecule present in the nucleus of living beings) and non-ligands (Pérez Fidalgo et al., 2012; Freitas, 2015; Boulanger et al., 2015).

Irritant medications are those that cause burning, phlebitis (inflammation of a vein), or pain when inserted into the vein incorrectly but hardly ever cause severe injuries to the body. When they are injected in significant amounts, they can cause wounds (ulceration) where the tissue is softer (Silva et al., 2018; Kreidieh et al., 2016; Souza et al., 2017; Kameo et al., 2015).

Vesicant drugs can cause more bad reactions to the tissue, leading to pain, blistering (vesicles), and, possibly, tissue death (necrosis) (Freitas, 2015). Besides, they can cause bad effects on tendons, nerves, bones, and ligaments, hindering the movement of the area that got in contact with the drug (Freitas, 2015). Non-vesicant drugs may cause pain during the extravasation but do not cause bad reactions in the body (Freitas, 2015; Reynolds et al., 2014).

DNA-ligand vesicant drugs generate substances (free radicals) that hinder protein production (protein synthesis), deeply, painfully, and extensively destroying the tissue. These drugs are more difficult to be eliminated from the body and may continue to increase the bad

reactions for up to 28 (twenty-eight) days after the extravasation. Vesicant drugs that do not have to connect to the DNA to work connect to healthy cells and are more accessible for the body to dispose of them (degrade). Because of that, the injury (lesion) stays in just one area and causes less pain (West Midlands Expert Advisory Group for Chemotherapy, 2017; Sauerland et al., 2006).

Table 3. Examples of vesicant, irritant, and non-vesicant medications

Irritant Medications	Non-vesicant Medications	Vesicant Medications
Bendamustine Carboplatin Carboplatin Carmustine Cisplatin Dacarbazine Daunorrubicin liposomal Doxorrubicin liposomal Streptozocin Etoposide Fluorouracil Ifosfamide Irinotecan Melphalan Mitoxantrone Oxaliplatin Paclitaxel Teniposide Topotecan	Aldesleukin Monoclonal antibodies Asparaginase Bendamustine Bevacizumab Bleomycin Bortezomib Cabazitaxel Cetuximab Cyclophosphamide Cisplatin Cytarabine Cladribine Etoposide Fludarabine Gemcitabine Interferon Interleukin-2 Methotrexate Pemetrexed Raltitrexed Rituximab Temsirolimus Thiotepa Trastuzumab Arsenic Trioxide	**DNA-ligands** Dactinomycin Daunorubicin Doxorubicin Epirubicin Streptozocin Gemcitabine Idarubicin Mechlorethamine Mitomycin Mitoxantrone **Non DNA-ligands** Cabazitaxel Docetaxel Paclitaxel Vinblastine Vincristine Vindesine Vinorelbine

Source: Pérez Fidalgo et al. (2012), Freitas (2015), Boulanger et al. (2015), West Midlands Expert Advisory Group for Chemotherapy (2017), Royal Cornwall Hospitals NHS Trust (2014).

3.4.2 Identification of risk factors and preventive care by the nursing team for extravasation

Evaluating some critical points is a strategy of the nursing team to reduce the risks of medicine administration and ensure quality assistance to the patient. Among these points are: analyze if the equipment to administer the chemotherapeutic drug is the best option; if there is a vein with alterations; if the patient is well-nourished; if there are varices (sclerosis) or weak veins; if the area for inserting the needle (puncture) has any wound or swelling (edema); if the blood is flowing (venous return); and, lastly, beware of any other medication has been injected in the same area (Souza et al., 2017; Bonassa; Santana, 2012).

See below some important points that require attention from the nursing professional to avoid problems related to extravasation (Souza et al., 2017; Schneider; Pedrolo, 2011).

PAY ATTENTION TO THE GUIDELINES RELATED TO THE EXTRAVASATION OF CHEMOTHERAPEUTICS:

- Administer the medicine preferably in large and robust veins, in parts of the body which the patient moves or uses less, but where there is strong blood flow (Souza et al., 2017; Schneider; Pedrolo, 2011);
- Choose appropriate needles for the area of medication administration (Souza et al., 2017; Schneider; Pedrolo, 2011);
- Direct the patient to stay still so that the needle does not move (Souza et al., 2017; Schneider; Pedrolo, 2011);
- Check the patient's position (Souza et al., 2017; Schneider; Pedrolo, 2011);
- Be attentive during the whole time of the medicine administration into the vein (Souza et al., 2017; Schneider; Pedrolo, 2011);
- Be attentive to all the information given by the patient, during the administration, about possible signs and symptoms of extravasation (Souza et al., 2017; Schneider; Pedrolo, 2011);
- Do not administrate vesicant medications for more than one hour in veins in the extremities (peripheral) (Souza et al., 2017; Schneider; Pedrolo, 2011).

3.4.3 Directions for cases of extravasation (When the drug for cancer treatment leaks from the vein into another tissue)

The complications during extravasation may be linked to the characteristics of (1) the patient, (2) the equipment, (3) the medication, and (4) the inappropriate professional practice (iatrogenesis). Regarding the medication, the problems may be related to factors such as vesicant potential, concentration, the amount that can be extravasated to other places,

exposure time to content in the areas, the site chosen for puncturing, devices used, and insertion technique (Melo et al., 2020; Kreidieh et al., 2016; Souza et al., 2017; Otto, 202; Matsui et al., 2017).

Regarding inadequate professional practice, among the associated factors are little training, the incorrect introduction of the needle, lack of monitoring of the devices on the patient, and lack of time to monitor the patient. Depending on the area the medication extravasated, an impairment may occur if the infiltrated areas contain tendons, articulations, or vessels. Functional damage may occur if the drug goes into an area with many articulations and in a great amount (Melo et al., 2020; Kreidieh et al., 2016; Souza et al., 2017; Otto, 202; Matsui et al., 2017).

Observing physical signs shown by the patients is also important for monitoring as a protective barrier and for avoiding more serious consequences from the extravasation. Thus, it is necessary to be aware of the patient's physical aspects, monitor the area of infusion, observe the existence of patchy lesions, fibrosis (tissue formation after a lesion as part of the scarring process), pain, scaling of the skin, blistering, hyperemia (increase in blood flow in the area), and functional and sensorial impairment of tendons, articulations, and nerves (Melo et al., 2020; Souza et al., 2017; Pérez Fidalgo et al., 2012; Otto, 202; Dougherty; Oakley, 2011).

One more barrier to avoiding or managing extravasation is monitoring the characteristics of the vascular access. Choosing the area where the access will be inserted is vital for greater protection of the articulations, tendons, and nerves to prevent damage to the patient's limbs. The intravenous approach (administration of the medication in the patient's vein) is advantageous because many veins can be used to administer chemotherapeutic drugs. However, it requires extreme care when choosing the area once the chosen one must go from the distal to the proximal direction. It also requires avoiding applications where there is little subcutaneous tissue and a significant number of tendons, e.g., in the back of the hand. Thus, this place is contraindicated for the infusion of vesicant drugs because the extravasation in the area tends to be complicated (Souza et al., 2017; Brito; Lima, 2012).

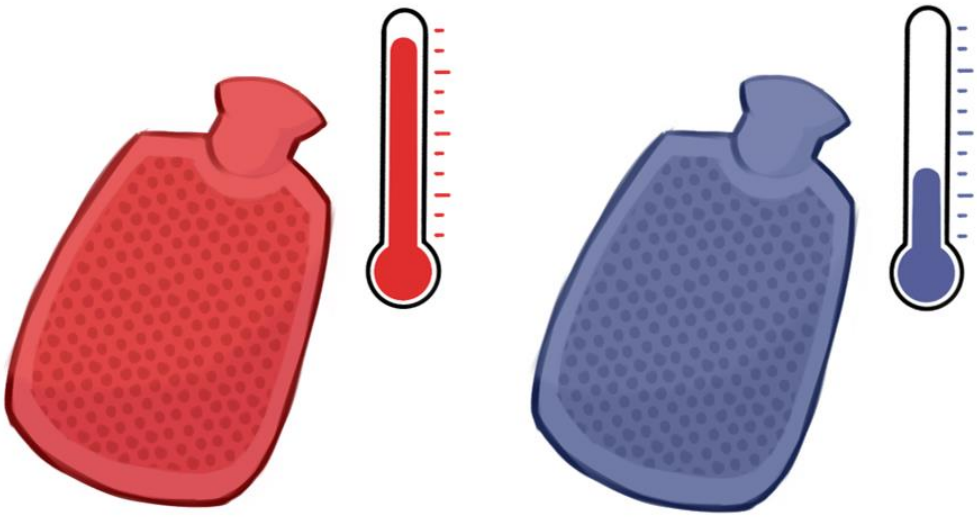
Extravasation control depends on the drug extravasated, the place of extravasation, the amount leaked, and the preparation of the nurses who will act in the event. Some ways of treating the extravasation immediately are applications of warm or cold compresses (depending on the medication extravasated), some antidotes, saline *washout*, and surgical interventions (Melo et al., 2020; Pérez Fidalgo et al., 2012; Freitas, 2015; Jackson-Rose et al., 2017; Pluschnig et al., 2015).

When the extravasation is identified, the nurse will initially try to pull the medicine through the patient's access (aspiration). Besides, the professional will put cushions under the limb with the access to elevate the area. After that, the professional may use thermal compresses (cold or warm). Depending on the medicine, the kind of compress may change because each has particularities. Then, the nurse will inform the patient about the treatments

or procedures that may be taken in case of extravasation (Melo et al., 2020; Pérez Fidalgo et al., 2012; Freitas, 2015; Jackson-Rose et al., 2017; Pluschnig et al., 2015).

3.4.3.1 Application of cold and/or warm compresses

Applying a warm compress allows the blood vessels (veins) to increase in size, i.e., dilate, facilitating absorption and distribution of the leaked medication. The technique of warm compresses is indicated in medications such as vinca alkaloids (vinorelbine, vinblastine, and vincristine), teniposide, oxaliplatin, and etoposide. The application of cold compress allows the blood vessels (veins) to decrease in size, i.e., become thinner, so there is a reduction of the extravasation speed of the medication to the tissues. The decrease in size helps reduce wounds and is indicated for anthracycline (daunorubicine, epirubicin, idarubicin, and doxorubicin). In some cases, the medication may like both warm and cold compresses without creating substantial problems for the patient (Souza et al., 2017; Schneider; Pedrolo, 2011; Gonzalez, 2013).



Warm compress

Cold compress

See below the kinds of compresses to be used in case of extravasation of drugs for cancer treatment (Pérez Fidalgo et al., 2012; Freitas, 2015; Boulanger et al., 2015; West Midlands Expert Advisory Group for Chemotherapy, 2017; Royal Cornwall Hospitals NHS Trust, 2014).

Table 4. Hot and cold compresses – Types of compresses that can be used depending on the chemotherapy

ATTENTION TO THE TYPES OF COMPRESSES		
Warm compress		
Carmustine	Vincristine	Oxaliplatin
Vindesine	Vinblastine	Vinorelbine
Cold compress		
Aldesleukin	Cytarabine	Dactinomycin
Docetaxel	Epirubicine	Fluorouracil
Irinotecan	Methotrexate	Pemetrexed
Thiotepa	Monoclonal antibodies	Bortezomib
Cladribine	Daunorubicin	Doxorubicin
Streptozocin	Gemcitabine	Interferon
Mitomycin	Raltitrexed	Topotecan
Asparaginase	Carboplatin	Dacarbazine
Daunorubicin	Doxorubicin	Fludarabine
Idarubicin	Mechlorethamine	Mitoxantrone
Temsirolimus	Bleomycin	
Warm and cold compress		
Bendamustin	Cisplatin	Paclitaxel
Cabazitaxel	Etoposide	Teniposide
Cyclophosphamide	Ifosfamide	Arsenic Trioxide

Source: own elaboration.

3.4.3.2 Use of antidote (substance that prevents or reduces potential damage) of chemotherapy drugs

The use of antidotes may help in the reduction of the effects caused by the extravasation, so it has a neutralizing role. The antidotes used in these cases differ depending on the extravasated medicine and can be directly applied on the skin or injected into the vein uso (Melo et al., 2020; Pérez Fidalgo et al., 2012; Harrold et al., 2015). Among the antidotes used in the extravasation are dexrazoxane, dimethyl sulfoxide (DMSO), hyaluronidase, sodium thiosulfate, and subcutaneous hydrocortisone/betamethasone topical.

Table 5. Types of antidotes used for managing extravasations

Antidote	Use	Information
Dexrazoxane	• Blocks the enzyme topoisomerase II, preventing the extravasated medicine from reaching more tissues, and binds to iron, preventing the formation of free radicals. • Used in the extravasation of anthracycline (daunorubicin, epirubicin, idarubicin, and doxorubicin) (Melo et al., 2020; Pérez Fidalgo et al., 2012; Muthuramalingam et al., 2013; Drake, 2012).	• It has a protective effect and needs to be administered in large veins, away from the area where the extravasation occurred. • Do not use it with cold compresses, which make the vessel thinner, making it more difficult for the antidote to reach the extravasation site. • May cause bad reactions, such as sickness (nausea), vomiting (emesis), local pain in the insertion (infusion), and an increase in the number of liver (hepatic) enzymes. • Use must be suspended 15 minutes before the application of medication (infusion).
Dimethylsulfoxide (DMSO)	• Used in topical form. • Helps the skin absorb the medication and eliminate free radicals (Melo et al., 2020; Olver et al., 1988; Wengström et al., 2008).	• Needs the skin to be cold (15 minutes of cooling before and after). • May cause bad reactions, such as: redness (erythema), burning, and scaling of the skin (itching) (Melo et al., 2020; Olver et al., 1988; Wengström et al., 2008).
Hyaluronidase	• Changes the way the tissue absorbs the extravasated medicine by breaking down hyaluronic acid. • Used in the extravasation of the medications vincristine, vindesine, vinorelbine e vimblastine (Melo et al., 2020; Pérez Fidalgo et al., 2012; Pluschnig et al., 2015).	• Prevents the death of the skin (necrosis). • The World Health Organization (WHO) indicates 1 mL of 150 UI/mL should be used subcutaneously (Melo et al., 2020; Pérez Fidalgo et al., 2012; Pluschnig et al., 2015).

Sodium Thiosulfate	• Reduces the number of hydroxyl radicals, reducing the extravasation of the lesion (Melo et al., 2020; Souza et al., 2017).	• It is indicated to use the concentration of 10% diluted in water and inject 2 mL in the vein to each milligram of the extravasation medicine (Melo et al., 2020; Souza et al., 2017).
Subcutaneous hydrocortisone / betamethasone topical	• Helps avoid tissue death (necrosis). • Used in the extravasation of the medications vincristine, vindesine, vinorelbine, vimblastin e Epipodophyllotoxin (Melo et al., 2020; Souza et al., 2017).	• May cause bad reactions in the patient, such as the increase of the lesion after the extravasation (Melo et al., 2020; Souza et al., 2017).
Washout or with saline lavage	• Executed quickly in the extravasation area. • Aims at removing, through dispersion medium, all the medication extravasated (Melo et al., 2020; Pérez Fidalgo et al., 2012; Dougherty; Oakley, 2011; Harrold et al., 2015).	• Application of sodium chloride 0.9% with the enzyme hyaluronidase • Sometimes, application of local anesthesia during the infusion might be necessary (Melo et al., 2020; Pérez Fidalgo et al., 2012; Dougherty; Oakley, 2011; Harrold et al., 2015).

Source: own elaboration.

Table 6. Step by step to be followed by nurses in case of extravasation

In case of extravasation or suspected extravasation, the nursing team must follow a step-by-step to manage the situation and avoid more serious problems for the patient, as described below:

a) **Interrupt/stop the infusion (medicine administration):** In case of suspected or confirmed extravasation, stopping the medicine infusion immediately is necessary.
b) **Do not remove the catheter:** The device connected to the access will be disconnected. However, one cannot remove the catheter because it facilitates the aspiration of the extravasated medication and allows the administration of the antidote (when necessary).
c) **Use saline solution, when indicated:** In some cases, washing the access with saline solution is not recommended because it might dilute the medicine.
d) **Remove the catheter:** If the antidote is not used, the catheter may be removed. If the antidote is necessary, the catheter must be removed after the administration. If necessary and prescribed by the assisting doctor, the nursing team may give an analgesic to relieve the pain. After that, the nurse can make a bandage in the area if needed.
e) **Application of thermal compresses (warm or cold):** In cases of cold compresses, use a clean cloth or gauze damped with cold water for 15 to 20 minutes, 4 (four) times a day in the first 24 hours. In cases of warm compresses, use a clean cloth or gauze damped with warm water for 20 minutes, 4 (four) times a day for 1 (one) or 2 (two) days.
f) **Elevate the limb:** The area damaged because of extravasation must be elevated to avoid edemas and more serious damage after the extravasation. The nurse will direct the patient and/or caregiver about the need to keep the limb elevated for a while, according to professional evaluation.
g) **Monitor, document, and direct:** The nurse has to keep good nursing records, describing the event in detail, informing the area, size, the aspect of the skin, the medication in use at the time, and their conduct to minimize the damage. It is also necessary that the nurse directs the patient and/or the caregiver about the event and the signs that should be monitored.
h) **Situations that require special care:** In extreme cases, the patient might need to be evaluated by the assisting doctor and, if indicated to a surgical procedure, the nursing team will provide the transportation of the patient to the O.R., according to the directions given to the nursing team by the sector that will receive the patient.

It is important to emphasize that all the conducts described in this chapter are, most of the time, implemented by the nursing team since they are with the patient 24 hours daily. However, today we always work with a multi-professional team (nurse, doctor, physical therapist, pharmacist, psychologist, social assistant, nutritionist, occupational therapist), so most conducts are decided together with the team.

Source: Lacy et al. (2005).

Table 7. Medicine spill: spillage of medication on the floor or the body

The cancer medicine can accidentally fall and spill the liquid on the floor or unintentionally have contact with the body. This case is considered an environmental accident because it contaminates the environment where the spillage happened. When the medication spills on the clothes, they must be immediately taken off without touching the contaminated area. The contaminated areas of the skin must be washed with water and soap. If the medication got in contact with the eyes or other mucous membranes (mouth, nose, etc.), these must be washed, without being rubbed, with water or isotonic solution saline 0.9%) in large amounts, and after that, seek medical assistance. To decontaminate the environment, first, one must isolate the spillage area and keep other people from getting closer and contaminating themselves. The professional responsible for the decontamination will need to wear protective equipment before initiating the procedure. Liquid medications are removed with dry absorbent compresses, and the contaminated area must be washed with water and soap in abundance. All residues should be discarded in plastic bags for toxic chemical waste.

Source: Agência Nacional de Vigilância Sanitária (2004).

REFERENCES

Bonassa EMA, Santana TR. Enfermagem em terapêutica oncológica. 4. ed. São Paulo, SP: Atheneu; 2012.

Boulanger J, Ducharme A, Dufour A, Fortier S, Almanric K; Comité de l'évolution de la pratique des soins pharmaceutiques (CEPSP), et al. Management of the extravasation of anti-neoplastic agents. Support Care Cancer. 2015 May;23(5):1459-71. doi: 10.1007/s00520-015-2635-7

Brito CD, Lima EDRP. Dispositivo intravascular periférico curto mais seguro para infusão de quimioterápicos antineoplásicos vesicantes: o que a literatura diz. Reme - Rev Min Enferm. 2012 [cited 2024 Mar 2];16(2):275-9. Available from: http://www.revenf.bvs.br/scielo.php?script=sci_arttext&pid=S1415-27622012000200017&lng=es&nrm=iso&tlng=pt

Corbett M, Marshall D, Harden M, Oddie S, Phillips R, McGuire W. Treatment of extravasation injuries in infants and young children: a scoping review and survey. Health Technol Assess. 2018 Aug;22(46):1-112. doi: 10.3310/hta22460

Dougherty L, Oakley C. Advanced practice in the management of extravasation. Cancer Nurs Practice. 2011;10(5):16-22.

Drake D. BET3: Emergency management of anthracycline extravasation. Emerg Med J. 2012 Sep;29(9):777-9. doi: 10.1136/emermed-2012-201686.4

Drucker AM, Rosen CF. Drug-induced photosensitivity: culprit drugs, management and prevention. Drug Saf. 2011 Oct 1;34(10):821-37. doi: 10.2165/11592780-000000000-00000

Freitas KABS. Estratégias para administração segura de antineoplásicos [dissertation on the Internet]. Botucatu, SP: Faculdade de Medicina de Botucatu, Universidade Estadual Paulista "Julio de Mesquita Filho"; 2015. Disponível em: https://repositorio.unesp.br/server/api/core/bitstreams/e8bc1270-7ee1-4124-8eda-def7fa8d67df/content

Gharib AM, Stern EJ, Sherbin VL, Rohrmann CA. Nasogastric and feeding tubes. The importance of proper placement. Postgrad Med. 1996 May;99(5):165-8, 174-6. PMID: 8650084.

Giavina-Bianch, P. Quimioterápicos podem causar alergias, mas há tratamento [Internet]. São Paulo, SP: ASBAI; 2018 jan. 23 [citado 2024 abr. 14]. Disponível em: https://asbai.org.br/quimioterapicos-podem-causar-alergias-mas-ha-tratamento/

Gonzalez T. Chemotherapy extravasations: prevention, identification, management, and documentation. Clin J Oncol Nurs. 2013 Feb;17(1):61-6. doi: 10.1188/13.CJON.61-66

Greenhill JV, McLelland MA. Photodecomposition of drugs. Prog Med Chem. 1990;27:51-121. doi: 10.1016/s0079-6468(08)70289-3.

Harrold K, Gould D, Drey N. The management of cytotoxic chemotherapy extravasation: a systematic review of the literature to evaluate the evidence underpinning contemporary practice. Eur J Cancer Care (Engl). 2015 Nov;24(6):771-800. doi: 10.1111/ecc.12363

Instituto Nacional de Câncer. Ações de enfermagem para o controle do câncer: uma proposta de integração ensino-serviço. 3. ed. rev., atual. e ampl. Rio de Janeiro: INCA; 2008 [citado 2024 abr. 30]. Disponível em: https://www.inca.gov.br/sites/ufu.sti.inca.local/files//media/document//acoes-enfermagem-controle-cancer.pdf

Jackson-Rose J, Del Monte J, Groman A, Dial LS, Atwell L, Graham J, et al. Chemotherapy extravasation: establishing a national benchmark for incidence among cancer centers. Clin J Oncol Nurs. 2017 Aug 1;21(4):438-445. doi: 10.1188/17.CJON.438-445

Kameo SY, Silva GM, Sawada NO, Hardman GL. Hyaluronidase post extravasation of intravenous vincristine: use in children with cancer. Rev Enferm UFPE on line. 2015 [cited 2024 Mar 5];9(9):9239-45. doi: 10.5205/reuol.7874-68950-4-SM.0909201511. Available from: https://periodicos.ufpe.br/revistas/index.php/revistaenfermagem/article/view/10723.

Kreidieh FY, Moukadem HA, El Saghir NS. Overview, prevention and management of chemotherapy extravasation. World J Clin Oncol. 2016 Feb 10;7(1):87-97. doi: 10.5306/wjco.v7.i1.87

Lacy CF, Armstrong LL, Goldman MP, Lance LL. Drug information handbook 2005-2006. Hudson: Lexi-Comp; 2005.

Marques RC, Pires L, Quintans E, coordenadores. Orientações para cuidadores de crianças e adolescentes com câncer. 1. ed. Rio de Janeiro, RJ: Instituto Desiderata; 2015 [citado 2024 abr. 14]. 68 p. ISBN: 978-85-61279-07-3. Disponível em: https://desiderata.org.br/wp/wp-content/uploads/2018/12/cartilha_para_cuidadores.pdf

Matsui Y, Murayama R, Tanabe H, Oe M, Motoo Y, Wagatsuma T, et al. Evaluation of the predictive validity of thermography in identifying extravasation with intravenous chemotherapy infusions. J Infus Nurs. 2017 Nov/Dec;40(6):367-374. doi: 10.1097/NAN.0000000000000250

Melo JMA, Oliveira PP, Souza RS, Fonseca DFD, Gontijo TF, Rodrigues AB. Prevention and conduct against the Extravasation of antineoplastic chemotherapy: a scoping review. Rev Bras Enferm. 2020 Jun 17 [citado 2023 nov. 16];73(4):e20190008. English, Portuguese. doi: 10.1590/0034-7167-2019-0008. Disponível em: https://www.scielo.br/j/reben/a/YBJdCmQjBGJtSRdxv6F4pvD/?lang=en

Ministério da Saúde (BR). Secretaria de Assistência à Saúde. Departamento de Sistemas de Redes Assistenciais. Protocolos Clínicos e Diretrizes Terapêuticas: remédios excepcionais. Brasília, BR: Ministério da Saúde; 2002.

Ministério da Saúde (BR); Agência Nacional de Vigilância Sanitária. Resolução - RDC nº 220, 21 de setembro de 2004. Brasília, DF; 2004 [cited 2023 Oct 5]. Available from: https://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2004/rdc0220_21_09_2004.html

Monteiro AF, Rato M, Martins C. Drug-induced photosensitivity: Photoallergic and phototoxic reactions. Clin Dermatol. 2016 Sep-Oct;34(5):571-81. doi: 10.1016/j.clindermatol.2016.05.006.

Moreira LB, Costa AF, Fuchs FD. In: Fuchs FD, Wannmacher L, Ferreira MBC, editores. Farmacologia clínica: fundamentos da terapêutica racional. 3. ed. Rio de Janeiro: Guanabara Koogan; 2004.

Muthuramalingam S, Gale J, Bradbury J. Dexrazoxane efficacy for anthracycline extravasation: use in UK clinical practice. Int J Clin Pract. 2013 Mar;67(3):244-9. doi: 10.1111/ijcp.12103. Erratum in: Int J Clin Pract. 2013 Aug;67(8):817. Dosage error in article text.

Olver IN, Aisner J, Hament A, Buchanan L, Bishop JF, Kaplan RS. A prospective study of topical dimethyl sulfoxide for treating anthracycline extravasation. J Clin Oncol. 1988 Nov;6(11):1732-5. doi: 10.1200/JCO.1988.6.11.1732

Otto SE. Oncologia. Rio de Janeiro, RJ: Reichmann & Affonso Editores; 2002.

Pérez Fidalgo JA, García Fabregat L, Cervantes A, Margulies A, Vidall C, Roila F, ESMO Guidelines Working Group. Management of chemotherapy extravasation: ESMO-EONS Clinical Practice Guidelines. Ann Oncol [Internet]. 2012 [cited 2023 Sep 28];23(Suppl 7):vii167-vii173. doi:10.1093/annonc/mds294. Available from: https://www.annalsofoncology.org/article/S0923-7534(19)37675-6/fulltext#%20

Pluschnig U, Haslik W, Bayer G, Soleiman A, Bartsch R, Lamm W, Steger GG, Zielinski CC, Mader RM. Outcome of chemotherapy extravasation in a large patient series using a standardised management protocol. Support Care Cancer. 2015 Jun;23(6):1741-8. doi: 10.1007/s00520-014-2535-2

Pluschnig U, Haslik W, Bayer G, Soleiman A, Bartsch R, Lamm W, Steger GG, Zielinski CC, Mader RM. Outcome of chemotherapy extravasation in a large patient series using a

standardised management protocol. Support Care Cancer. 2015 Jun;23(6):1741-8. doi: 10.1007/s00520-014-2535-2

Resende IM. Reações adversas da quimioterapia em crianças e adolescentes [Internet]. Natal, RN: Casa Durval Paiva; 2017 jun. 21 [citado 2024 abr. 14]. Disponível em: https://www.casadurvalpaiva.org.br/artigos/139/Reacoes-adversas-da-quimioterapia-em-criancas-e-adolescentes-139

Reynolds PM, MacLaren R, Mueller SW, Fish DN, Kiser TH. Management of extravasation injuries: a focused evaluation of noncytotoxic medications. Pharmacotherapy. 2014 Jun;34(6):617-32. doi: 10.1002/phar.1396

Royal Cornwall Hospitals NHS Trust. Clinical Guideline for the Management in Extravasation of Cytotoxic Drugs in Adults. [Truro, Cornwall, UK]: Royal Cornwall Hospitals; 2014 Dec [updated 2014 Dec; cited 2024 Jan 30]. Available from: https://docplayer.net/23907946-Clinical-guideline-for-the-managementof-extravasation-of-cytotoxic-drugs-in-adults-1-aim-purpose-ofthis-guideline.html

Sales CA, Grossi ACM, Almeida CSL, Silva JDD, Marcon SS. Cuidado de enfermagem oncológico na ótica do cuidador familiar no contexto hospitalar. Acta Paul Enferm. 2012;25(5):736-742. Disponível em: https://doi.org/10.1590/S0103-21002012000500014.

Sauerland C, Engelking C, Wickham R, Corbi D. Vesicant extravasation Part I: mechanisms, pathogenesis, and nursing care to reduce risk. Oncol Nurs Forum. 2006;33(6):1134-1141. DOI: 10.1188/06.ONF.1134-1141

Schalka S, Steiner D. Consenso Brasileiro de Fotoproteção. An Bras Dermatol. 2014;89(6 Supl 1):S6-75. Disponível: https://issuu.com/sbd.br/docs/consensob.fotoprote____oleigo-web?e=0/6449812

Schneider F, Pedrolo E. Extravasamento de drogas antineoplásicas: avaliação do conhecimento da equipe de enfermagem. Reme - Rev Min Enferm. 2011 [cited 2024 Mar 5];15(4):522-9. Available from: http://www.revenf.bvs.br/scielo.php?script=sci_arttext&pid=S1415-27622011000400008&lng=es&nrm=iso&tlng=pt

Silva SMO, Alves IDF, Silva TM, Brandão CP, Santos AG. Levantamento dos índices de extravasamento de quimioterápicos no ambulatório de quimioterapia do centro de assistência de alta complexidade de oncologia (CACON) - HUPAA. Gep News [Internet]. 2018 [cited 2023 Dec 5];1(1):172-7. Available from: http://www.seer.ufal.br/index.php/gepnews/article/view/4706/3310.

Souza NR, Bushatsky M, Figueiredo EG, Melo JTS, Freire DA, Santos ICRV. Oncological emergency: the work of nurses in the extravasation of antineoplastic chemotherapeutic drugs. Esc Anna Nery. 2017;21(1):e20170009. doi:10.5935/1414-8145.20170009

Universidade Federal de Minas Gerais, Faculdade de Medicina, Departamento de Pediatria. Orientações para o cuidado de crianças com câncer. Coordenação: Gilberto Boaventura. Belo Horizonte, MG: Departamento de Pediatria/FM/UFMG; [2013?; citado 2024 abr. 14]. Disponível em: https://ftp.medicina.ufmg.br/observaped/cartilhas/cartilha-criancas-com-cancer.pdf

Wengström Y, Margulies A; European Oncology Nursing Society Task Force. European Oncology Nursing Society extravasation guidelines. Eur J Oncol Nurs. 2008 Sep;12(4):357-61. doi: 10.1016/j.ejon.2008.07.003

West Midlands Expert Advisory Group for Chemotherapy; Editor Sam Toland, Lead Chemotherapy Nurse, Worcester Acute Hospitals. Guidelines for the Management of Extravasation of a Systemic Anti-Cancer Therapy Including Cytotoxic Agents. England, UK: NHS; 2017 July 19 [updated 2019 July 19; cited 2024 Jan 30]. Available from: https://www.england.nhs.uk/midlands/wp-content/uploads/sites/46/2019/05/management-extravasation-of-a-systemic-anti-cancer-therapy-including-cytotoxic-agents.pdf

White R, Bradnam V. Handbook of Drug Administration via Enteral Feeding Tubes. London, UK: Pharmaceutical Press; 2007. 569 p. ISBN 0-85369-648-9.

Williams NT. Medication administration through enteral feeding tubes. Am J Health Syst Pharm. 2008 Dec 15;65(24):2347-57. doi: 10.2146/ajhp080155.

Nursing Care: patient

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All the professionals working in the healthcare network in hospitals, health centers, clinics, or emergency units, are essential in caring for children/teenagers with cancer. In this chapter, you will understand better how nursing professionals can help on the Journey to a safer and smoother treatment.

Nursing plays a fundamental role in the treatment of a hospitalized child with cancer and in supporting family because they work directly in administering medications and monitoring patients' daily routines. Thus, due to this proximity, these professionals can help

guide and clarify doubts that patients and caregivers may have regarding the disease and the treatment (Instituto Nacional de Câncer – INCA, 2008).

1 NURSING CARE DURING HOSPITALIZATION

Nursing cares with the hospitalized child or teenager for cancer treatment can be divided, in short, into (1) personal care and (2) care related to medications. Besides directly participating in the care, nursing professionals can guide the patient's caregivers, so they are also aware of personal care and care with medications.

As for personal care, the caregiver must pay attention to directions given by the nurses about hygiene, which includes using the bathroom and brushing the teeth. As for care with medications, the caregiver also must pay attention to the nurses' directions about the medications the patient is using, especially about the unwanted effects and changes that might happen during and/or after their use. Thus, as the caregiver is close to the child or teenager most of the time in the hospital, they can help nurses with this care in addition to being wary of any odd signs the patient may develop due to the use of medication so that they can report uncommon or unwanted situations (INCA, 2008).

Hand washing

Brushing teeth

Below you can see some situations or information the caregiver should report to nursing if they observe something during the period of the child's/teenager's hospitalization.

ATTENTION TO SITUATIONS THAT SHOULD BE REPORTED TO NURSING

1. Inform nursing about bad reactions observed in the child/teenager after medication use. Some of these reactions after using chemotherapeutic drugs may have immediate or late effects, and even in the case of known effects, they must always be reported to nursing. Examples of immediate bad reactions a few hours after use of the medication are wounds where the chemotherapeutic drug is administered, headache or skin allergy (itching and/or rash all over the body or in the place where the drug was administered), shivering, fever, nausea, dizziness, feeling faint. As for late harmful effects, there may be all-the-time tiredness, fast weight loss, nausea, and vomiting- The caregiver must always immediately call nursing as soon as they notice any alteration or change in the clinical conditions of the child/teenager under treatment. Another vital information the caregiver must report to the nursing team is if the child shows difficulty breathing because it might mean a more severe allergy (Resende, 2017; Giavina-Bianch, 2018; Sales et al., 2012).

Weight loss

Tiredness

Rash

Wound on the skin

Headache

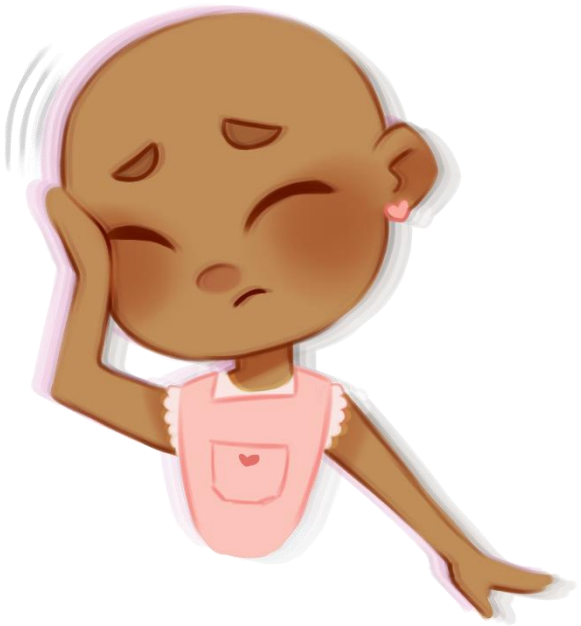
Dizziness

Allergy

Chill

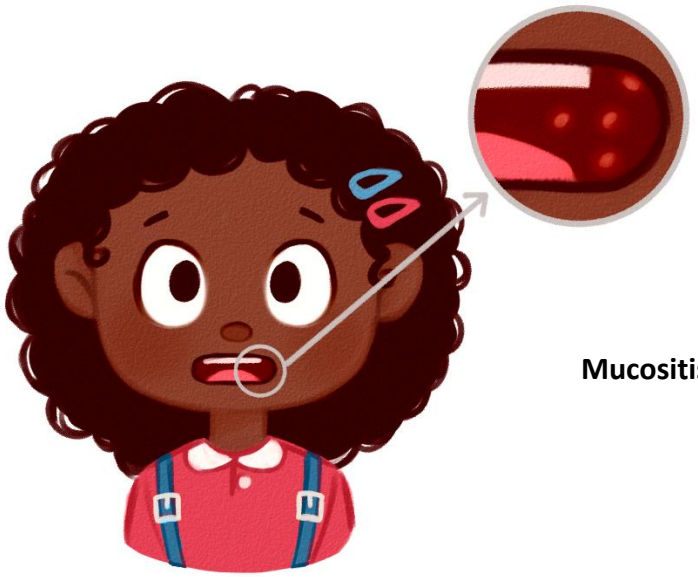
Fever

Difficulty breathing



Feeling faint

2. The caregiver must also inform if the child/teenager has been having difficulty taking the medications because of a bad reaction they might be feeling, for example. Non-adherence, that is, not taking the drug or taking it wrongly, may hinder the child's/teenager's treatment and interfere with the result and its total cure (INCA, 2008).
3. The caregiver must also inform if they have any questions about the disease, the necessary care, and the protocol of the child's/teenager's treatment. This is essential information, and the caregiver must be informed of all aspects of the treatment, which includes written information regarding bad reactions the chemotherapeutic drug may cause for many years (INCA, 2008).
4. Inform if the child is eating well, if they have any difficulty swallowing if they are urinating enough, or if the urine is foamy. It is also essential to observe the color of the poo, if it looks hard or soft, and if the child shows any diarrhea or constipation (INCA, 2008; Marques et al., 2015).
5. Inform if the child has any wound in the mouth or digestive system (the injuries might indicate a case of mucositis, which requires assistance from the health team) (Marques et al., 2015).



Mucositis

Nursing may instruct the caregiver to write a report of the child's/teenager's signs and symptoms, possible alterations, and questions that have arisen so that nothing goes unnoticed.

2 PRECAUTIONS IN THE BATHROOM

The caregiver often stays in the hospital with the child or teenager. Thus, some precautions are essential before, during, and after showering, including the common bathroom use for the caregiver and the patient (Marques et al., 2015; Universidade Federal de Minas Gerais, [2013?]).

In the case of the patient who has been using chemotherapeutic drugs, there is a need for closer attention to showering. At this moment, it is essential to follow an order for cleaning: wash (1) hands, (2) face, (3) head, (4) belly, (5) back, (6) arms, (7) legs and, if the child has a catheter, it should be the last item to be cleaned, being careful to avoid contamination (Marques et al., 2015; Universidade Federal de Minas Gerais, [2013?]).

Besides, it is essential to be careful with the bathroom used by this child/teenager on the day the chemotherapeutic drug is administered and on the two subsequent days. After using the toilet, one must flush three times with the lid down, and the toilet must be cleaned from the inside out, ending the cleaning with bleach. If the caregiver is responsible for changing the child's/teenager's diapers, it is necessary to use gloves and disposable materials. All the contaminated materials must be disposed of into two plastic bags, which must be tightly closed (Marques et al., 2015; Universidade Federal de Minas Gerais, [2013?]).

3 PRECAUTIONS WITH THE MEDICATIONS ADMINISTERED THROUGH A TUBE

Child with tube

Many times, oncologic patients are unable to swallow solid particles (such as medications and food) and need to take the medication through a tube. The tube enters through the mouth or the nose and takes the medication in liquid form to the stomach or intestine. Some extra care must be taken with patients that need to use the drugs through the tube (Moreira et al., 2004; Ministério da Saúde (BR), 2002).

It is essential to pay attention to cases in which the patient is using the tube for feeding and need to administer medication simultaneously through the same tube. In this case, the health team will check the compatibility of the drug and the food administered via tube (nutrients of enteral nutrition) to change the time for medication intake if the effect of the medication is decreased because of the food (Moreira et al., 2004; Ministério da Saúde (BR), 2002).

When the medication cannot be administered with food, the health professionals will adapt the times and procedures so that the patient gets the drug and the food through the tube safely, as described below. Feeding may be interrupted for two hours so that the medication can be administered without getting in contact with this food. Another critical point is the attention that should be given to cleaning the tube. For cleaning the tube and also keeping it from getting blocked (obstructed), it is essential that the nurse washes the inside of the tube with a syringe containing 15 to 30ml of tepid water. This step is made before and after administering the medication, to remove any residue of the food or medicine that may have gotten stuck in the tube (Moreira et al., 2004; Ministério da Saúde (BR), 2002; Williams, 2008).

When more than one medication needs to go through the tube simultaneously, cleaning must be compulsory between the administration of both drugs with 5 to 10 mL of tepid water (Williams, 2008). When there is a blockage (obstruction) of the tube, it is necessary to use 50mL of tepid water. In this case, there should be attention to the speed applied to the plunger not to damage the tube. If the blockage (obstruction) continues, the tube should be washed with carbonated water or alkaline solution (Gharib et al., 1996).

The health team needs to pay attention to the characteristics of the drug (such as PH and viscosity), for they are factors related to the formation of a solid part (precipitation) in the tube, which would be one reason for the blockage (obstruction). Besides, another point for attention is the concentration (osmolarity) because drugs with high concentration administered through a tube may cause diarrhea and colic in the patient. So, when it comes to a liquid formulation, many aspects must be observed on administration through a line, even if, apparently, it does not do any harm (Moreira et al., 2004; Ministério da Saúde (BR), 2002).

ATTENTION TO SOME PILLS* THAT SHOULD NOT BE TAKEN VIA		
Albendazole	Vitamin B Complex (Multivitamin)	Nifedipine
Amoxicilin + Clavulanate	Dexclorfeniramine	Sulfamethoxazole +Trimethroprim
Azithromycin	Dimehydrinate + Pyridoxine	Ferrous Sulfate
Calcitriol	Isosorbid	Temozolamide
Cephalexin	Levetiracetam	Mineral Oil*
Ciclosporin	Mercaptopurine	
Potassium Chloride	Mycophenolate Mofetil	

Fonte: White and Bradnam (2007).

Precaution with bleedings and purple spots throughout the child's body:

- Avoid medicines and teas made with plants.
- Avoid unprescribed medicines.
- Brush teeth smoothly using very soft toothbrushes.
- Wear shoes even inside the home.
- Be careful with sharp and edgy objects within the reach of the child.
- Use moisturizers for the skin and mouth to prevent cracking and dryness.
- Avoid plays, games and exercises which can cause bumping, stumbling or hitting the body.
- Do not pull the scabs of any injury.
- Do not pop the pimples.
- If your daughter has a period, ask the doctor to prescribe a highly absorbing pad.
- If there is gum bleeding, rinse the mouth with cold water or suck ice chips.
- If the nose bleeds, press one nostril at a time and block it for 5 to 10 minutes.
- If any other part of the body bleeds, press the wound with a tissue until the bleeding stops.
- Put some ice on the purple spots that appear.
- Seek medical assistance as soon as possible (ST. Jude Children's Research Hospital, 2024).

REFERENCES

Gharib AM, Stern EJ, Sherbin VL, Rohrmann CA. Nasogastric and feeding tubes. The importance of proper placement. Postgrad Med. 1996 May;99(5):165-8, 174-6. PMID: 8650084.

Giavina-Bianch, P. Quimioterápicos podem causar alergias, mas há tratamento [Internet]. São Paulo, SP: ASBAI; 2018 jan. 23 [citado 2024 abr. 14]. Disponível em: https://asbai.org.br/quimioterapicos-podem-causar-alergias-mas-ha-tratamento/

Instituto Nacional de Câncer. Ações de enfermagem para o controle do câncer: uma proposta de integração ensino-serviço. 3. ed. rev., atual. e ampl. Rio de Janeiro: INCA; 2008 [citado 2024 abr. 30]. Disponível em: https://www.inca.gov.br/sites/ufu.sti.inca.local/files//media/document//acoes-enfermagem-controle-cancer.pdf

Marques RC, Pires L, Quintans E, coordenadores. Orientações para cuidadores de crianças e adolescentes com câncer. 1. ed. Rio de Janeiro, RJ: Instituto Desiderata; 2015 [citado 2024 abr. 14]. 68 p. ISBN: 978-85-61279-07-3. Disponível em: https://desiderata.org.br/wp/wp-content/uploads/2018/12/cartilha_para_cuidadores.pdf

Ministério da Saúde (BR), Secretaria de Assistência à Saúde, Departamento de Sistemas de Redes Assistenciais. Protocolos Clínicos e Diretrizes Terapêuticas: remédios excepcionais. Brasília, BR: Ministério da Saúde; 2002.

Moreira LB, Costa AF, Fuchs FD. Antipsicóticos. In: Fuchs FD, Wannmarcher L, Ferreira MB. Farmacologia clínica. 3. ed. Rio de Janeiro: Guanabara Koogan; 2004. p. 577-86.

Resende IM. Reações adversas da quimioterapia em crianças e adolescentes [Internet]. Natal, RN: Casa Durval Paiva; 2017 jun. 21 [citado 2024 abr. 14]. Disponível em: https://www.casadurvalpaiva.org.br/artigos/139/Reacoes-adversas-da-quimioterapia-em-criancas-e-adolescentes-139

Sales CA, Grossi ACM, Almeida CSL, Silva JDD, Marcon SS. Cuidado de enfermagem oncológico na ótica do cuidador familiar no contexto hospitalar. Acta Paul Enferm. 2012;25(5):736-742. Disponível em: https://doi.org/10.1590/S0103-21002012000500014.

Universidade Federal de Minas Gerais, Faculdade de Medicina, Departamento de Pediatria. Orientações para o cuidado de crianças com câncer. Coordenação: Gilberto Boaventura. Belo Horizonte, MG: Departamento de Pediatria/FM/UFMG; [2013?; citado 2024 abr. 14]. Disponível em: https://ftp.medicina.ufmg.br/observaped/cartilhas/cartilha-criancas-com-cancer.pdf

White R, Bradnam V. Handbook of Drug Administration via Enteral Feeding Tubes. London, UK: Pharmaceutical Press; 2007. 569 p. ISBN 0-85369-648-9.

Williams NT. Medication administration through enteral feeding tubes. Am J Health Syst Pharm. 2008 Dec 15;65(24):2347-57. doi: 10.2146/ajhp080155.

ST. Jude Children's Research Hospital. Sangramentos e hematomas [Internet; citado 2024 maio 20]. Disponível em: https://together.stjude.org/pt-br/diagn%C3%B3stico-tratamento/efeitos%20colaterais/sangramento-hematoma-trombocitopenia.html

Appropriate Disposal of Medicines

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- Do not reuse empty medicine bottles and packaging Programa Descarte Consciente, 2022; Conselho Regional de Farmácia do Estado do Paraná; Crippa et al., 2017);

- Do not dispose of medications in the sink, toilet, or regular trash bins Programa Descarte Consciente, 2022; Conselho Regional de Farmácia do Estado do Paraná; Crippa et al., 2017);
- Dispose of medicines for cancer at the pharmacy in the hospital or clinic where treatment is carried out because they will be treated in an appropriate place (incinerated). They will be put (wrapped) in an orange plastic bag because they are identified as chemical waste (Agência Nacional de Vigilância Sanitária, 2018);

- The medicines which are not meant for cancer treatment should be disposed of at a Unidade Básica de Saúde (basic health unit – UBS), drugstores, or collection locations closer to your home (Agência Nacional de Vigilância Sanitária, 2018);
- If you need to dispose of syringes and needles, put them in PET bottles to avoid accidents. For example, Filgrastim – Granulokine, which is used to improve immunity, may be administered subcutaneously using syringes and needles when the patient is not home (Agência Nacional de Vigilância Sanitária, 2018).

REFERENCES

Agência Nacional de Vigilância Sanitária. Resolução da Diretoria Colegiada-RDC nº 222, de 28 de março de 2018. Regulamenta as Boas Práticas de Gerenciamento dos Resíduos de Serviços de Saúde e dá outras providências. Diário Oficial da União. 2018 mar. 29;61(seção 1):76.

Conselho Regional de Farmácia do Estado do Paraná. Descarte de Medicamentos [Internet]. Curitiba, 2018 jun. [cited 2022 dez. 10], edição 004. Available from: https://www.crf-pr.org.br/pagina/visualizar/291

Crippa A, Vasconcellos C, Corte TWF, Engroff P, Feijó AGS. Descarte correto de medicamentos: construção de uma cartilha educativa. Saúde em Redes. 2017;3(1):07-17. DOI: http://dx.doi.org/10.18310/2446-4813.2017v3n1p07-17

Programa Descarte Consciente. O problema ambiental [Internet; 2022 dez. 10]. Available from: https://www.descarteconsciente.com.br

Vaccines

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Cláudia Valente

The child/teenager needs medical orientation to receive vaccines, and some vaccines cannot be used in children under treatment with medications against cancer (chemotherapeutic drugs). Thus, it is important to follow all orientations.

There are vaccines produced in many ways, with live attenuated microorganisms, inactivated or killed microorganisms, fractions or subunits of genetic material (Figure 1). When the child is treating cancer, their body's defense is reduced (low immunity). Thus, when undergoing treatment, the child should not receive vaccines made from live attenuated compounds and only take vaccines under orientation by the doctor or vaccination centers (World Health Organization - WHO, 2021; Fundação Oswaldo Cruz, 2016; Toscano; Kosim, 2003).

Figure 1 - Pharmacist producing the vaccine

Examples of types of vaccines:

- **Virus-like particles (VLP)**: Human Papilloma Virus (HPV) (Zardo et al., 2014);
- **Killed/inactive parts or compounds**: COVID-19 (WHO, 2023; Ministério da Saúde (BR), 2021); Diphtheria and Tetanus (Double Adult – dT) (Ministério da Saúde (BR), 2021); the Flu (Influenza) (Ministério da Saúde (BR), 2021); Pneumococcus (Pneumococcal 13-valent, Pneumococcal 23-valent) (Ministério da Saúde (BR), 2021); Poliomyelitis or Infantile Paralysis (VIP); Diphtheria, Tetanus e Pertussis (dTpa) (Ministério da Saúde (BR), 2015); Meningococcal ACWY (Ministério da Saúde (BR), 2015); Hepatitis A (Ministério da Saúde (BR), 2015);
- **Weakened (attenuated) virus**: Poliomyelitis or Infantile Paralysis (VOP) (Toscano; Kosim, 2003) – in drops (oral); Measles, Rubella and Mumps (MMR) (Ministério da Saúde (BR), 2021); Yellow Fever (Ministério da Saúde (BR), 2021); Measles and Rubella (MR) (Ministério da Saúde (BR), 2021); Human Rotavirus (VORH) (Ministério da Saúde (BR), 2015); Measles, mumps, rubella and chicken pox (MMRV) (Ministério da Saúde (BR), 2015);
- **Weakened (attenuated) bacteria**: Tuberculosis (BCG) (Ministério da Saúde (BR), 2021);
- **Synthetic Genetic material**: COVID-19 (WHO, 2023).

However, they all need the child's/teenager's doctor's orientation to evaluate the use.

Vaccines which CAN be used by the child/teenager (Toscano; Kosim, 2003)

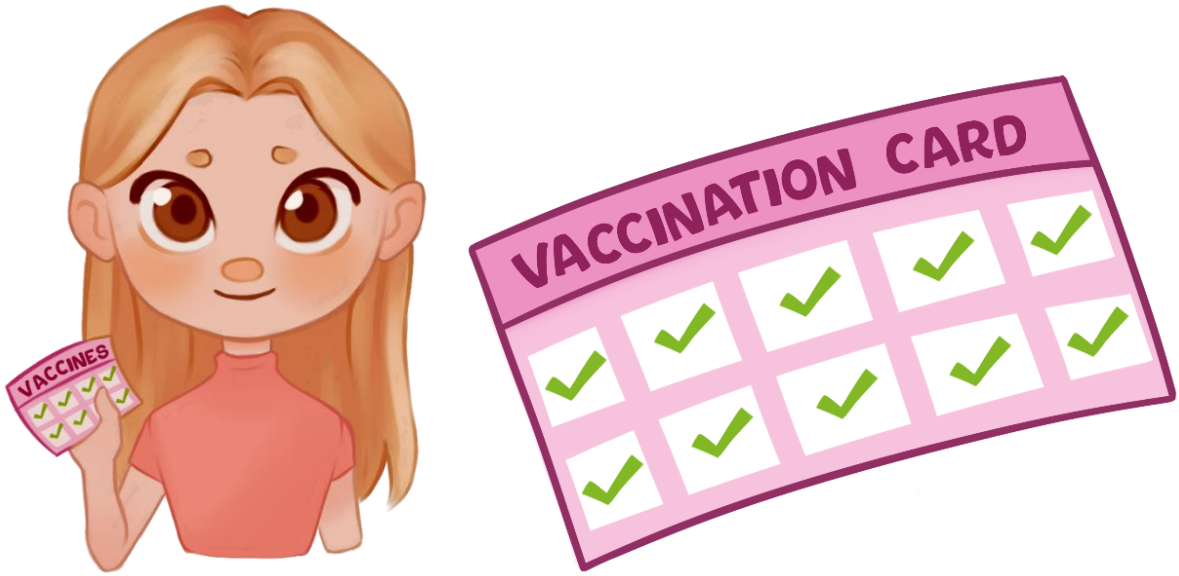
VACCINES	COMPONENTS	PREVENTED DISEASES
Against hepatitis B	Virus surface antigen (Recombinant)	Hepatitis B
Against hepatitis A	Inactive virus	Hepatitis A
Tetravalent (DTP + Hib) diphtheria, tetanus, pertussis, type b Haemophilus influenzae	Products of PRP bacteria (toxins) conjugated with a protein	Diphtheria, tetanus, pertussis, meningitis, and other infections by type b Haemophilus influenzae
Against infection by Pneumococcus. Pn13.	Streptocuccus pneumoniae Polysaccharides	Pneumonia, otitis, meningitis, and other diseases caused by Pneumococcus
Meningococcal ACWY	Conjugated	Invasive disease caused by Neisseria meningitidis C
Against diphtheria, tetanus, and pertussis (DTP)	Killed bacteria and products of bateria (toxins)	Diphtheria, tetanus, pertussis
Against polimyelitis – injectable vaccine (VIP)	Inactivated virus	Poliomyelitis

Vaccines which MUST be avoided during treatment (Toscano; Kosim, 2003)

VACCINES	COMPONENTS	PREVENTED DISEASES
Against tuberculosis (BCG-ID)	Live-attenuated bacteria	Severe forms of tuberculosis (specially miliary and meningeal)
Against poliomyelitis – oral vaccine (VOP)	Live-attenuated virus types I, II, and III	Poliomyelitis or Infantile Paralysis
Oral vaccine of attenuated G1P1 (Sociedade Brasileira de Imunizações, 2023) human rotavirus	Live-attenuated virus	Diarrhea by rotavirus
Against yellow fever	Live-attenuated virus	Yellow Fever
MMR-vaccine Against measles, mumps and rubella	Live-attenuated virus	Measles, mumps, rubella

ATTENTION: It is important that caregivers and closer relatives to the child/teenager with cancer and under treatment with chemotherapeutic drugs are up-to-date with vaccines (Figure 2).

Figure 1 - Caregiver showing his son's ID card up to date



REFERENCES

Fundação Oswaldo Cruz. Instituto de Tecnologia em Imunobiológicos Bio-Manguinhos. Vacinas: as origens, a importância e os novos debates sobre seu uso [Internet]. Rio de Janeiro: Bio-Manguinhos/Fiocruz; 2016 jul. 25 [cited 2023 set. 20]. Available from: https://www.bio.fiocruz.br/index.php/br/noticias/1263-vacinas-as-origens-a-importancia-e-os-novos-debates-sobre-seu-uso?showall=1&limitstart

Ministério da Saúde (BR). Secretaria de Ciência, Tecnologia, Inovação e Insumos Estratégicos em Saúde. Departamento de Ciência e Tecnologia. Vacinas em desenvolvimento contra Covid-19 – 12 de março de 2021 [recurso eletrônico]. Brasília: Ministério da Saúde, 2021 [cited 2023 set. 20]. Available from: https://www.gov.br/saude/pt-br/assuntos/coronavirus/vacinas/pdfs/20210312_cgpclin_decit_sctie_ms_vacinas_em_desenvolvimento_contra_covid-19-1.pdf

Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Programa Nacional de Imunização. Brasília; 2015.

Sociedade Brasileira de Imunizações. Calendários de vacinação SBIm pacientes especiais – 2023-2024. São Paulo: SBIm; 2023 [cited 2023 set. 20]. Available from: https://sbim.org.br/images/calendarios/calend-sbim-pacientes-especiais.pdf

Toscano C, Kosim L. Cartilha de vacinas: para quem quer mesmo saber das coisas. Brasília: Organização Pan-Americana da Saúde; 2003.

World Health Organization. Coronavirus disease (COVID-19): Vaccines and vaccine safety [Internet]. Geneva: WHO; 2023 June 28 [cited 2023 Sept 20]. Available from: https://www.who.int/news-room/q-a-detail/coronavirus-disease-(covid-19)-vaccines

World Health Organization. Vaccines and immunization: What is vaccination? [Internet]. Geneva: WHO; 2021 Aug 30 [cited 2023 Sept 20]. Available from: https://www.who.int/news-room/q-a-detail/vaccines-and-immunization-what-is-vaccination

Zardo GP, Farah FP, Mendes FG, Franco CAGS, Molina GVM, Melo GN, et al. Vacina como agente de imunização contra o HPV. Ciênc Saúde Coletiva. 2014;19(9):3799-3808. https://doi.org/10.1590/1413-81232014199.01532013

Adverse Reaction of Excipients: A Pediatric Approachr

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1 FORMULATIONS FOR CHILDREN: GUIDELINES AND PRECAUTIONS

The choice of a doctor when prescribing pediatric medications should take into consideration both their effectiveness and the potential adverse effects. Additionally, the child's age, weight, and the development of their body should be taken into consideration (Mello, 2006; Simons; Tibboel, 2006; Hill, 2005; Kearns et al., 2003; Koren, 2003; Burg; Bourret, 1994).

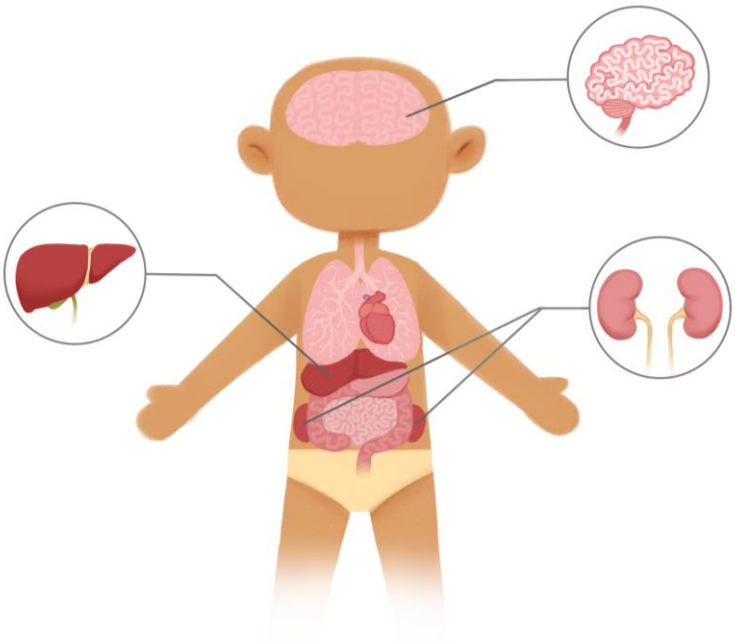
Medications are composed of active components that serve to alleviate pain or prevent vomiting, for example. They also contain other ingredients to provide color, flavor, preservation, and even improve the appearance, making it easier for a child to take the medication (excipients) (Hill, 2005; Balbani et al., 2006; Mello, 2006; Pifferi; Restani, 2003). These excipients are not inert components in the formulation and can potentially cause adverse effects (Balbani et al., 2006; Heineck et al., 2006; Marcovitch, 2005; Pifferi; Restani, 2003).

The functioning of a child's body is different from that of an adult. Therefore, the dosage of medication must be personalised (individualised) according to the child's body composition (Bartelink et al., 2006; Mello, 2006; Simons; Tibboel, 2006; Kearns et al., 2003; Koren, 2003; Burg; Bourret, 1994).

During childhood, the child’s body is maturing. The completion of growth varies individually. In general, by the age of 12, teenagers weigh, on average, around 40 kg and usually tolerate the effects of medications without adverse reactions or with reactions similar to adults. However, some teenagers may begin puberty late and, consequently, finish their growth later than their peers (Figure 1). Therefore, the effects of medications and their excipients vary significantly. Another important factor is that after taking the medication, it must be eliminated (Silva, 2006; Katzung, 2005; Alcorn; McNamara, 2003; Labaune, 1993). To

be eliminated, the medication needs to be broken down into smaller particles, a process mainly handled by the liver (Silva, 2006; Katzung, 2005; Johnson, 2003; Alcorn; McNamara, 2003; Labaune, 1993). Subsequently, elimination occurs through urine or faeces (Silva, 2006; Katzung, 2005; Alcorn; McNamara, 2003; Labaune, 1993).

Figure 2 - The Functioning of a child's body



Special care must be taken with premature babies who need to be hospitalized and take medications, as well as with new borns, as their bodies gradually develop as they grow (Silva, 2006; Simons; Tibboel, 2006; Katzung, 2005; Alcorn; McNamara, 2003; Labaune, 1993).

Treatment should be carried out taking various factors into consideration to prevent adverse effects from the medication or its excipients. Therefore, it's important for the healthcare team to carefully identify which excipients are part of the medication that the child needs to take.

To find out which excipients are present in the formulations, you can check the leaflet or the box of the medication. The excipients will be listed under the "COMPOSITION" section, usually at the beginning of the leaflet, or it may be written on the box or the medication's packaging (Figure 2).

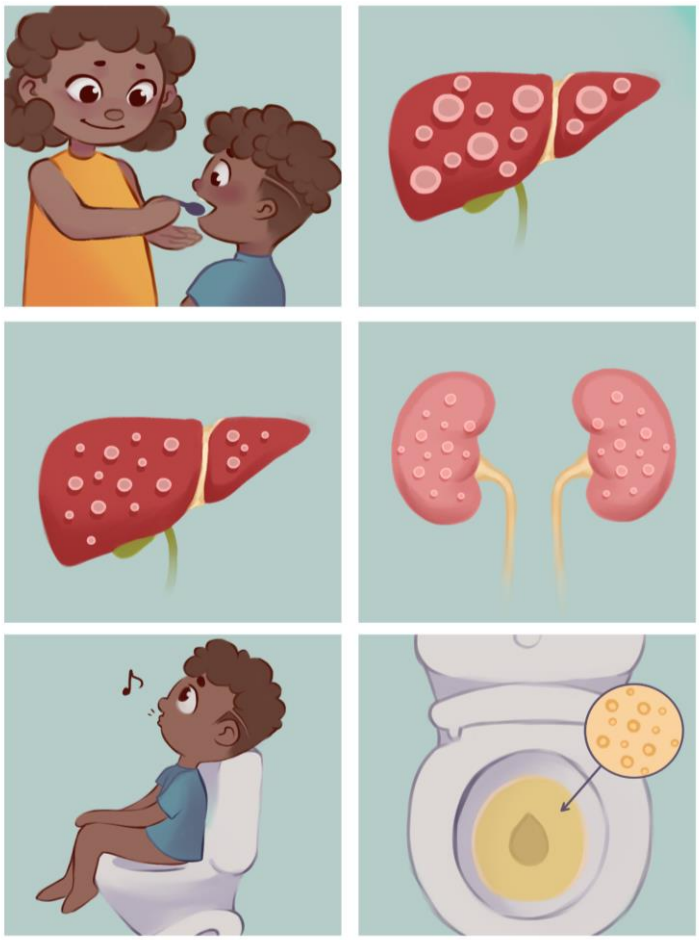
Figure 3 - Mother looking for the composition in the medicine box

2 FOR ORAL USE

For children, especially young ones, the taste of liquid medications should, whenever possible, be pleasant to facilitate their use. Remember that all medications should be kept out of children's reach and should always be administered by a caregiver.

Alcohol is present in some medications for various purposes, such as a solvent (Little, 2004), to dissolve or extend the shelf life. Depending on the child's age, they may have difficulty eliminating alcohol from their system. The younger the child, the more difficult it is for their body to eliminate alcohol. The liver is responsible for breaking down alcohol into smaller pieces for elimination (Johnson, 2003). When a child reaches the age of 12, their kidneys are similar to those of adults, allowing for easier elimination of alcohol through urine (Figure 3).

Figure 4 - Step by step elimination of the medicine from the child's body



Examples of preparations that may contain alcohol include liquid homoeopathic formulations and elixirs. Elixir is not recommended, but alcohol is still used in liquid medications because it is sometimes the only agent that can dissolve many substances in the formulation (Peiré García, 2019).

Just like alcoholic beverages, when taken in large quantities, medicine containing alcohol can have adverse effects, such as dizziness, drowsiness, and speech difficulties. Some serious effects of long-term use of alcohol-containing medicines include poor memory, difficulty breathing, and irregular heartbeat (Rowe et al., 2009; European Medicines Agency, 2006; Klasco, 2006; Kibbe, 2000; Fiocchi et al., 1999).

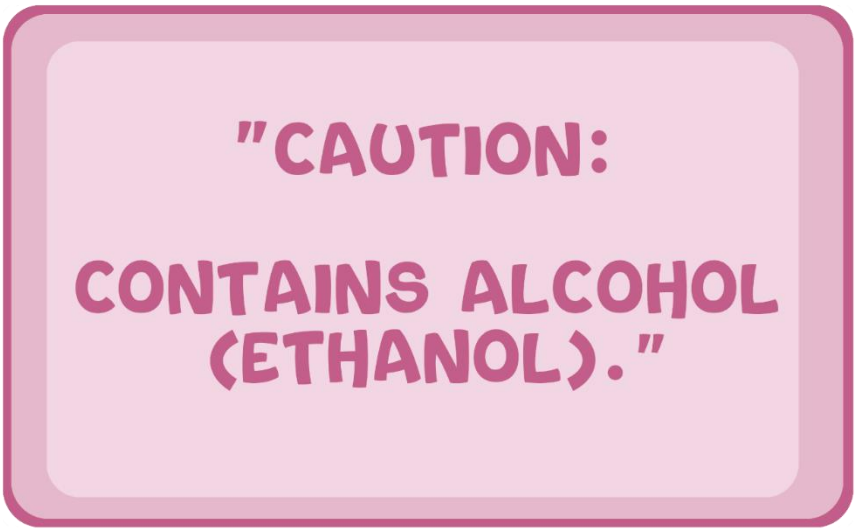
In Brazil, since 2001, the presence of ethanol has been prohibited in appetite stimulants, growth enhancers, tonics, and iron and phosphorus supplements (Figure 4).

Figure 5 - Examples of medicine that may contain alcohol

Vitamins (multivitamins) used for children must have a maximum alcohol content of 0.5%, and the following statement must be included in the product leaflet and label: 'Contains 0.5% ethanol'' (Agência Nacional de Vigilância Sanitária - Anvisa, 2023a, 2022, 2002). Caregivers can find on the product leaflet (Figure 5), label, and box of medications some warnings about the presence of alcohol, so it is important to always consult all of them (Figure 6).

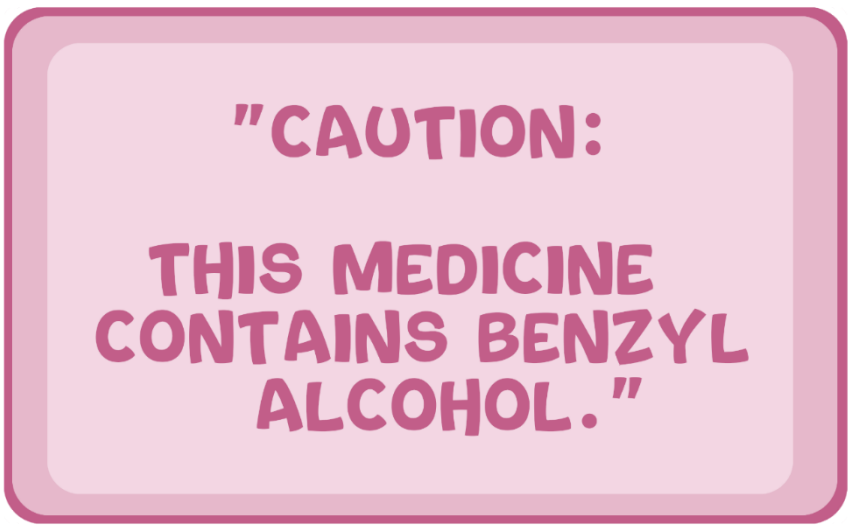
Figure 6 – Leaflet

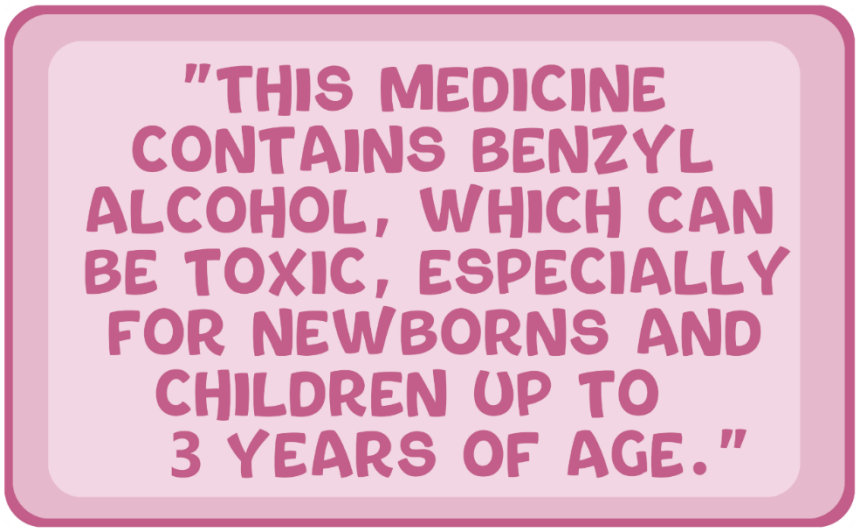
Figure 7 - Warning phrase about the concentration of alcohol in the medicine



Caution should be exercised when using medications that contain benzyl alcohol and its derivatives such as sodium benzoate or benzoic acid in their formulation. The liver is responsible for breaking down benzyl alcohol into smaller pieces for elimination (Johnson, 2003). In newborns, fatal cases of intoxication can occur, along with other adverse effects such as shortness of breath, nausea, and vomiting (Rowe et al., 2009). Benzyl alcohol has also been associated with adverse effects such as wheezing, breathing difficulties, neurological problems, seizures, and low blood pressure (Gershanik et al., 1982). The use of benzyl alcohol is contraindicated in children under 3 years of age (Rowe et al., 2009). The presence of benzyl alcohol will be highlighted, and caregivers can identify it by referring to the medication's leaflet (Figure 7).

Figure 8 – Warning phrase about the concentration of benzyl alcohol in the medicine

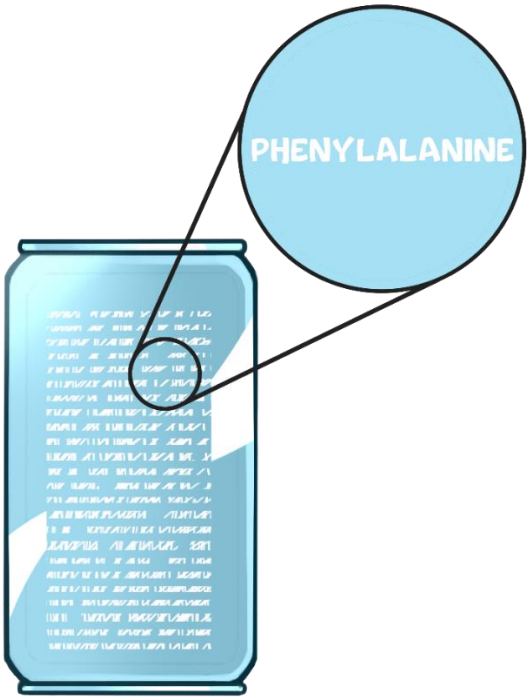




Propylene glycol is another excipient commonly found in medications and can be used as a solvent, among other functions (Kibbe, 2000). In newborns, the liver is immature. The liver is responsible for breaking down propylene glycol into smaller pieces for elimination (Johnson, 2003). Therefore, it takes time to eliminate propylene glycol through urine (European Medicines Agency, 2006; Kibbe, 2000; "Inactive" [...], 1997). Propylene glycol can cause adverse effects such as diarrhea, ear problems, heart problems, neurological problems, kidney problems, abdominal pain, nausea, vomiting, and cramps (European Medicines Agency, 2006; Kibbe, 2000; "Inactive" [...], 1997; Yorgin et al., 1997). Propylene glycol can also affect hormone levels and have adverse effects on the skin (Prusakiewicz et al., 2007; Reisch, 2005).

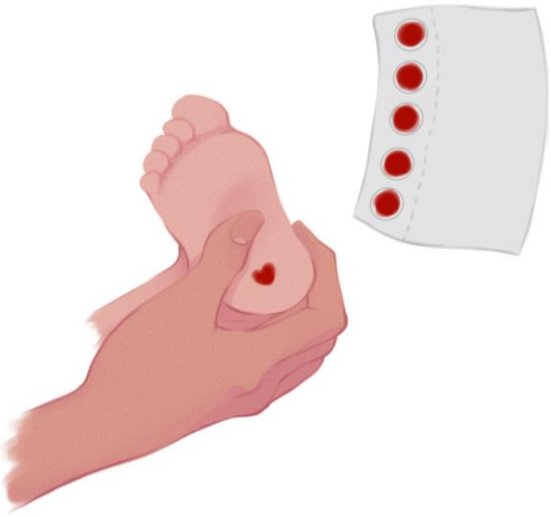
Other components (sweeteners) may be used to sweeten medications, such as sugar, aspartame, cyclamate (Renwick et al., 2004), and saccharin. The main component used to sweeten medications is sugar. Sugar should not be used in children with diabetes (Peres et al., 2005). When it is necessary to use medications with sugar, the insulin doses prescribed for children with diabetes should be adjusted according to medical guidance. If the child can take the medication with sugar, they should brush their teeth immediately afterward to prevent cavities (Neves et al., 2007; Soffritti et al., 2007; Peres et al., 2005). Some medications that contain sugar include pain relievers, cough medicines, antibiotics (Peres et al., 2005), antiparasitic medications, asthma treatments (salbutamol) containing saccharin and cyclamate as sweeteners, and medications for nausea (Soffritti et al., 2007; Peres et al., 2005). Aspartame, which is a sweetener, should not be used by pregnant women as it can pass to the baby and cause adverse effects, including brain problems. An artificial sweetener that may be present in soft drinks is phenylalanine (Figure 8). Pregnant women should avoid consuming soft drinks containing phenylalanine as it can have adverse effects on the baby, especially if the foetus has phenylketonuria, a metabolic disorder.

Figure 9 - Soft drinks that contain phenylalanine (sweetener)



Phenylketonuria is a severe and rare genetic disorder caused by a deficiency of an enzyme called phenylalanine hydroxylase in the child's genetic makeup (Yilmaz et al., 2023). When the enzyme phenylalanine hydroxylase works slowly, the amount of phenylalanine increases in the child's blood and body, which, if left untreated, can lead to serious effects such as reduced brain size, delayed development, seizures, and irreversible behavioural damage. The heel prick test identifies phenylketonuria shortly after birth (Yilmaz et al., 2023) (Figure 9).

Figure 10 - Heel prick test

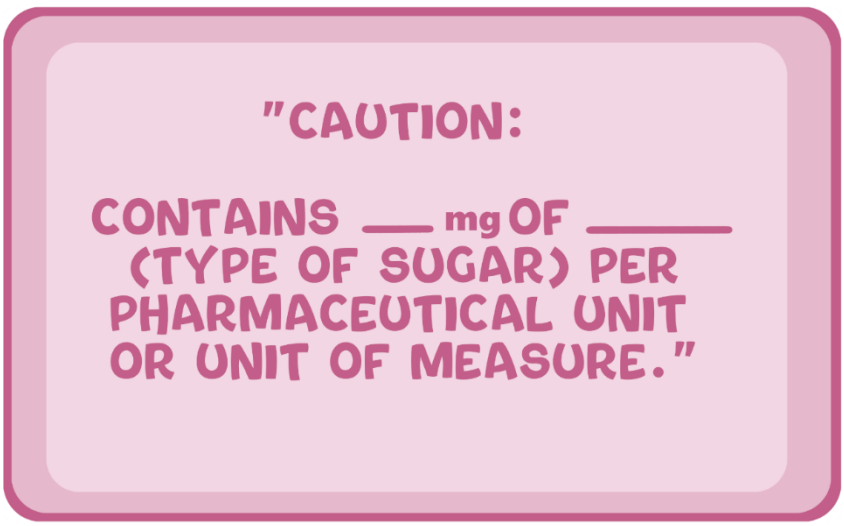


The ingredients used to sweeten medications can be combined, such as saccharin and cyclamate (Renwick et al., 2004). Be aware of adverse effects such as skin allergies or itching when exposed to sunlight (Kibbe, 2000; "Inactive" [...], 1997). Other adverse effects include nausea, diarrhoea, rapid heartbeat, and headaches (Kibbe, 2000; "Inactive" [...], 1997). Mothers should be mindful of the presence of sweeteners like cyclamate and saccharin, whether in food or medications. If the child is taking a sulfa antibiotic, sweeteners like saccharin and cyclamate cannot be used at the same time as sulfa. The simultaneous use of saccharin and cyclamate is contraindicated.

The baby's liver is still developing, and by the age of 2, it's possible to consider that the liver can metabolize medications and sweeteners. It is not recommended to give medications and foods containing cyclamate and saccharin to children under two years of age. Also, be aware that products with cyclamate and saccharin may contain sodium, which can lead to increased blood pressure and eye problems (cataracts) (Renwick et al., 2004).

When a child requires long-term medication for certain medical conditions, it's preferable to choose liquid medications that do not contain sugar in their formula. Various phrases on medication labels may indicate the presence of sucrose (Figure 10). Be sure to check the labels of medications (Anvisa, 2023b).

Figure 11 - Warning phrase about the presence of sugar in medicines



"THIS MEDICATION SHOULD NOT BE USED BY PEOPLE WITH GLUCOSE-GALACTOSE MALABSORPTION SYNDROME."

"THIS MEDICATION SHOULD NOT BE USED BY PEOPLE WITH SUCRASE-ISOMALTASE INSUFFICIENCY."

"CAUTION:

USE WITH CARE IN INDIVIDUALS WITH DIABETES."

Sorbitol is another substance used as a sweetener in medications. It can be found in liquid formulations that do not require shaking (solution) or need to be shaken (suspension). Sorbitol can be used in children with diabetes and does not cause tooth decay, but it can have side effects such as gas, diarrhoea, and abdominal pain (Neves et al., 2007; Balbani et al., 2006; European Medicines Agency, 2006; Peres et al., 2005; Kibbe, 2000). In the body, sorbitol can be converted into another sugar called fructose and should not be used in children with liver problems or low blood sugar (European Medicines Agency, 2006). The presence of sorbitol is indicated in the medication's leaflet and on the pack of the medication (Figure 11).

Figure 12 - Warning phrase about the presence of sorbitol

Preservatives are added to medications in different amounts to maintain the formula's quality and ensure that the medication remains effective until the expiration date indicated on the packaging. Parabens are a group of synthetic compounds made in the laboratory, used

to preserve medications due to their ability to inhibit the growth of bacteria which can contaminate the medication. Parabens include different components, including methylparaben, ethylparaben, propylparabens, and butylparaben. These parabens are the most common (Bethea et al., 2020; Nowak et al., 2018).

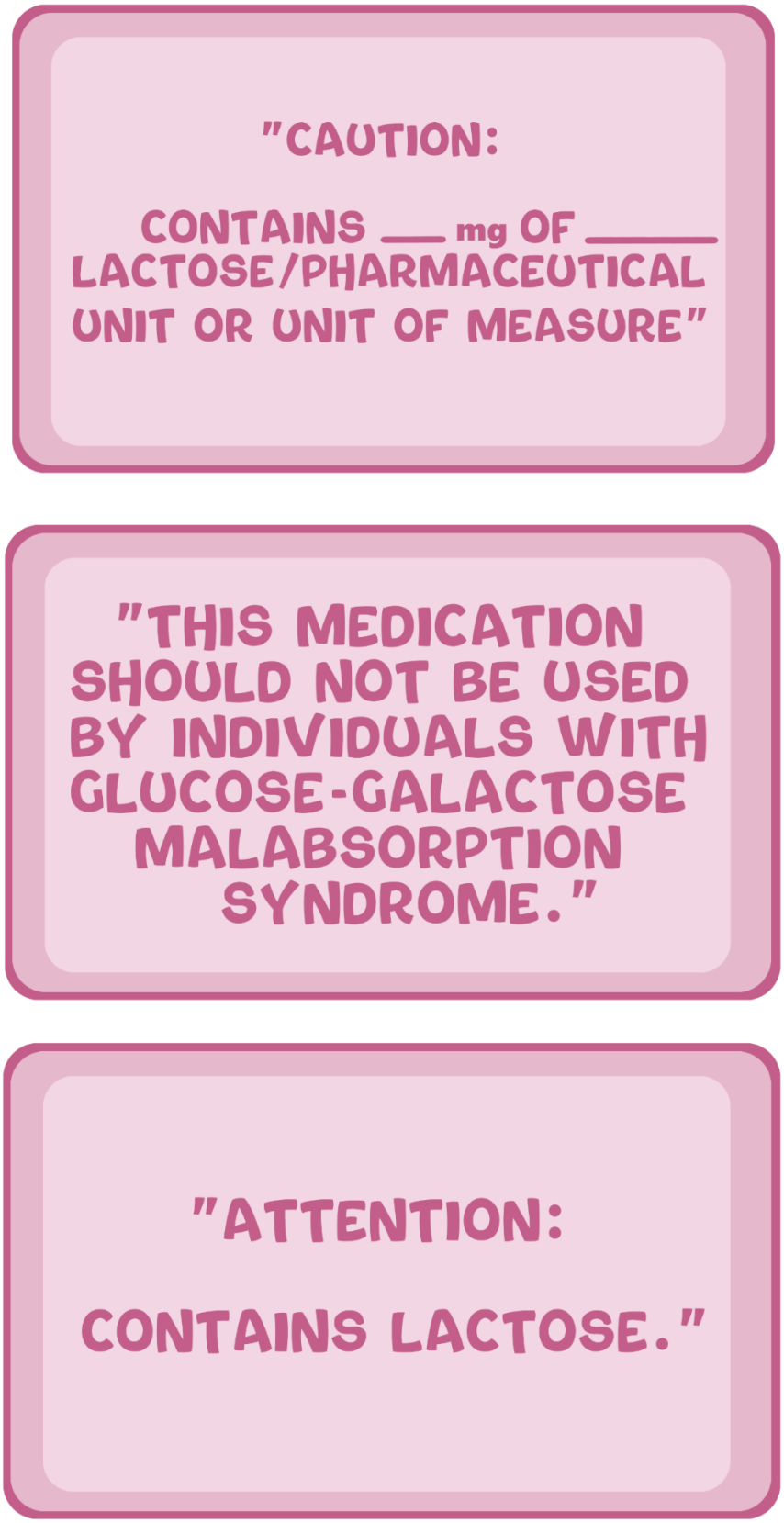
These substances should not be consumed by children until complete pubertal development and at the completion of growth, (adolescents with growth of less than 2 cm in one year, girls with a bone age of 14 years, and boys with a bone age of 16 years). The end of growth does not necessarily coincide with the onset of menstruation in girls and varies individually, depending on skeletal maturation (bone age), which may not always align with chronological age.

Parabens and their derivatives can advance and speed up pubertal development, as well as accelerate bone maturation, leading to the premature conclusion of statural growth. This can result in a child having a shorter stature than the standard average for their family members, for instance, or girls may experience menstruation before the age of 10 (Rosenfield et al., 2020; Cabaleiro et al., 2014). Read the label or leaflet to determine if the medication contains parabens as preservatives. Parabens rarely cause serious allergic reactions (Cabaleiro et al., 2014; Balbani et al., 2006; kibbe, 2000).

Moreover, the use of preparations containing parabens should be avoided during pregnancy because they can pass into breast milk (Dualde et al., 2020). A group of researchers in Spain conducted a study to determine the amount of parabens that pass into breast milk (Dualde et al., 2020). A total of 120 mothers participated in the study, and it was found that breast milk contained 41 to 60% of parabens and 61 to 89% of non-conjugated parabens. It is important to determine the quantity of these preservatives found in breast milk. The estimated daily intake of parabens in breastfeeding newborns ranged from 0 to 10 mg/kg/day, which was considered acceptable (Dualde et al., 2020).

Lactose can also be present in the medication, and it is important to be aware if the child has lactose intolerance, as well as if the child cannot digest galactose, the sugar resulting from the digestion of lactose (galactosemia). Effects like diarrhea, vomiting, nausea, and gas can occur (Pawar; Kumar, 2002). The presence of lactose in orally administered medications will be highlighted in phrases on the leaflet and boxes (Figure 12).

Figure 13 - Warning phrase about the presence of lactose in the medicine



In Brazil, there is a pending bill (PL 2390/2023) that makes it mandatory for hospitals, clinics, or other healthcare facilities to inform patients about the presence of lactose or milk proteins in the medication composition. According to deputy Ruy Carneiro (PSC-PB) and Luizianne Lins (PT-CE), lactose intolerance and milk protein allergies are different conditions that affect a large part of the population. Therefore, this alert is important to ensure differentiated treatment and the establishment of unified clinical protocols in Brazil.

The CONITEC (National Commission for the Incorporation of Technologies) was in favor of publishing protocols for Milk Protein Allergy (Recommendation Report No. 441/2019). This protocol allowed the supply of nutritional formulas based on smaller proteins, with or without lactose, and based on free amino acids for children aged 0 to 24 months who were diagnosed by the Unified Health System as being allergic to milk protein.

Sulfites are used in medicines to prevent them from spoiling during their shelf life (antioxidants) (Kibbe, 2000). If a child takes medicine containing sulfites orally, it may cause stomach pain (Kibbe, 2000).

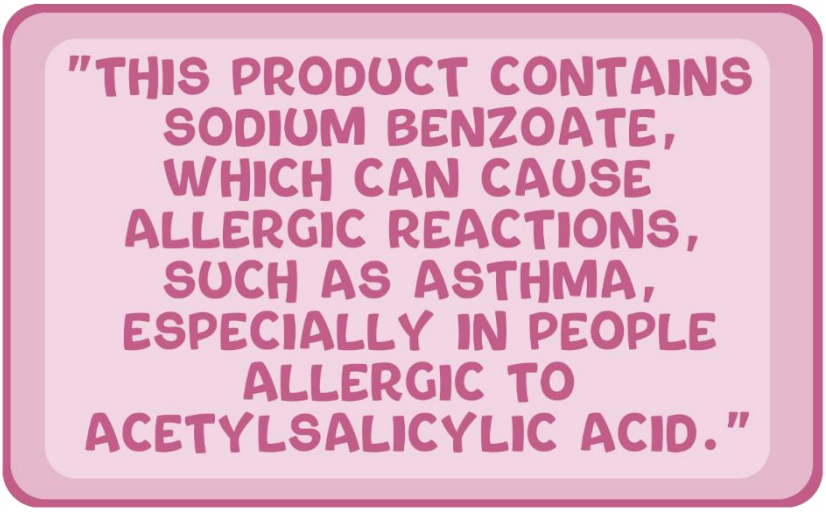
In cases where the medicine the child is taking contains a large amount of sulfite, in addition to stomach pain, the child may also experience diarrhea, circulatory problems, and drowsiness (Kibbe, 2000).

Moreover, sulfites can cause serious respiratory effects (bronchospasm and anaphylaxis) (Kibbe, 2000; Napke; Stevens, 1984), especially if the child already has a lung disease, such as asthma ("Inactive" [...], 1997).

Sodium benzoate is another excipient used in medicines (Kibbe, 2000). The most common adverse effects of sodium benzoate include respiratory problems when administered by injection (parenteral route). If administered orally, it cannot be given for up to 28 days because the baby's ability to metabolize benzoate is incomplete, which can lead to adverse effects (European Medicines Agency, 2006). Other adverse effects include severe skin allergies and even breathing difficulties in children who are already allergic to medicines containing salicylates (aspirin) (Kibe, 2000). Sodium benzoate should be avoided in children up to 3 years of age (Balbani et al., 2006; European Medicines Agency, 2006; Kibbe, 2000).

Whenever sodium benzoate is present in any formulation, there will be a statement on the medicine's leaflet and packaging (Figure 13).

Figure 14 - Warning phrase about the presence of sodium benzoate in the medicine

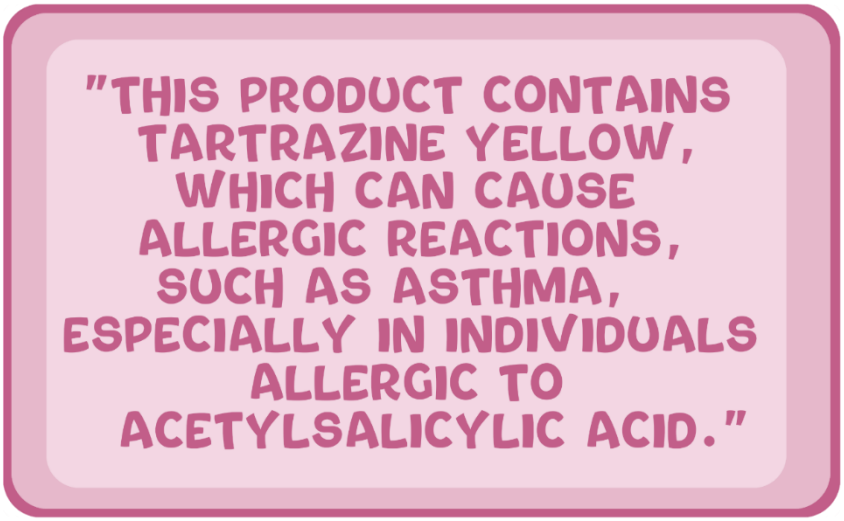


Colourants are also used in formulations for children. In general, colourants should be avoided in pharmaceutical formulas, as many have been associated with hypersensitivity and hyperkinetic activity (tremors and agitation) in children) (Balbani et al., 2006; European Medicines Agency, 2006; Pawar; Kumar, 2002; Kibbe, 2000; "Inactive" [...], 1997). The yellow tartrazine (FDC No. 5) has a similar structure to benzoates, salicylates, and indomethacin, which may lead to allergic reactions in combination with these drugs (Anvisa, 2007).

It is estimated that hypersensitivity to tartrazine occurs in 0.6 to 2.9% of the population, with a higher incidence in individuals predisposed to allergies or with salicylate intolerance. Approximately 2 to 20% of asthmatics are sensitive to aspirin. The most common clinical manifestations are itching and difficulty breathing (Balbani et al., 2006; Pawar; Kumar, 2002; "Inactive" [...], 1997).

Severe allergy incidence is rare. There are cases of individuals who have developed serious skin problems (atopic dermatitis), stomach or intestinal issues, as well as triggering involuntary movements or restlessness in children (Elhkim et al., 2007; Balbani et al., 2006; "Inactive" [...], 1997). Products containing tartrazine as a colouring excipient in their formulations must include a warning statement in the leaflet and labelling of secondary packaging (Anvisa, 2007; World Health Organization, 2007) (Figure 14).

Figure 15 - Warning phrase about the presence of tartrazine yellow in the medicine



The use of sunset yellow dye has been associated with severe allergic reactions, including severe swelling of the face, throat, hands, and feet (Anvisa, 2007; "Inactive" [...], 1997; Napke; Stevens, 1984).

There may be cross-reactivity between sunset yellow, paracetamol, acetylsalicylic acid (Anvisa, 2007), sodium benzoate, and other dyes. Patients with aspirin allergies may develop allergies to tartrazine dyes such as erythrosine, ponceau, sunset yellow, and red No. 40. Other skin reactions include skin peeling and sensitivity to light ("Inactive" [...], 1997).

3 FOR INJECTABLE USE

Administering medicine intravenously to infants must be done very carefully because their veins are very thin. Additionally, the proportion of water in a child's body varies until the age of 12, which influences the accumulation or elimination of the medicine.

Excipients present in some intravenous formulations can cause various adverse effects. Since infants have immature kidneys (renal development is completed at the age of 12), there can be an increase in the quantity of certain excipients, including propylene glycol, benzyl alcohol, and polyethylene glycol. This can lead to a toxic effect in the baby, causing adverse effects such as increased sodium and glucose levels in the blood (Lim et al., 2014).

The child's body will only be ready to completely eliminate propylene glycol at the age of four (Lim et al., 2014).

The younger the baby, the greater the accumulation of propylene glycol, benzyl alcohol, and polyethylene glycol in the body. Adverse effects can be more severe. Therefore, it's important for the mother to assist the healthcare team by reading the leaflet like a detective.

Injectable preparations containing benzyl alcohol have been associated with adverse effects such as respiratory syndrome in premature infants and children, including wheezing and difficulty breathing (Rowe et al., 2009; Giacoia; Mattison, 2006; Gershanik et al., 1982).

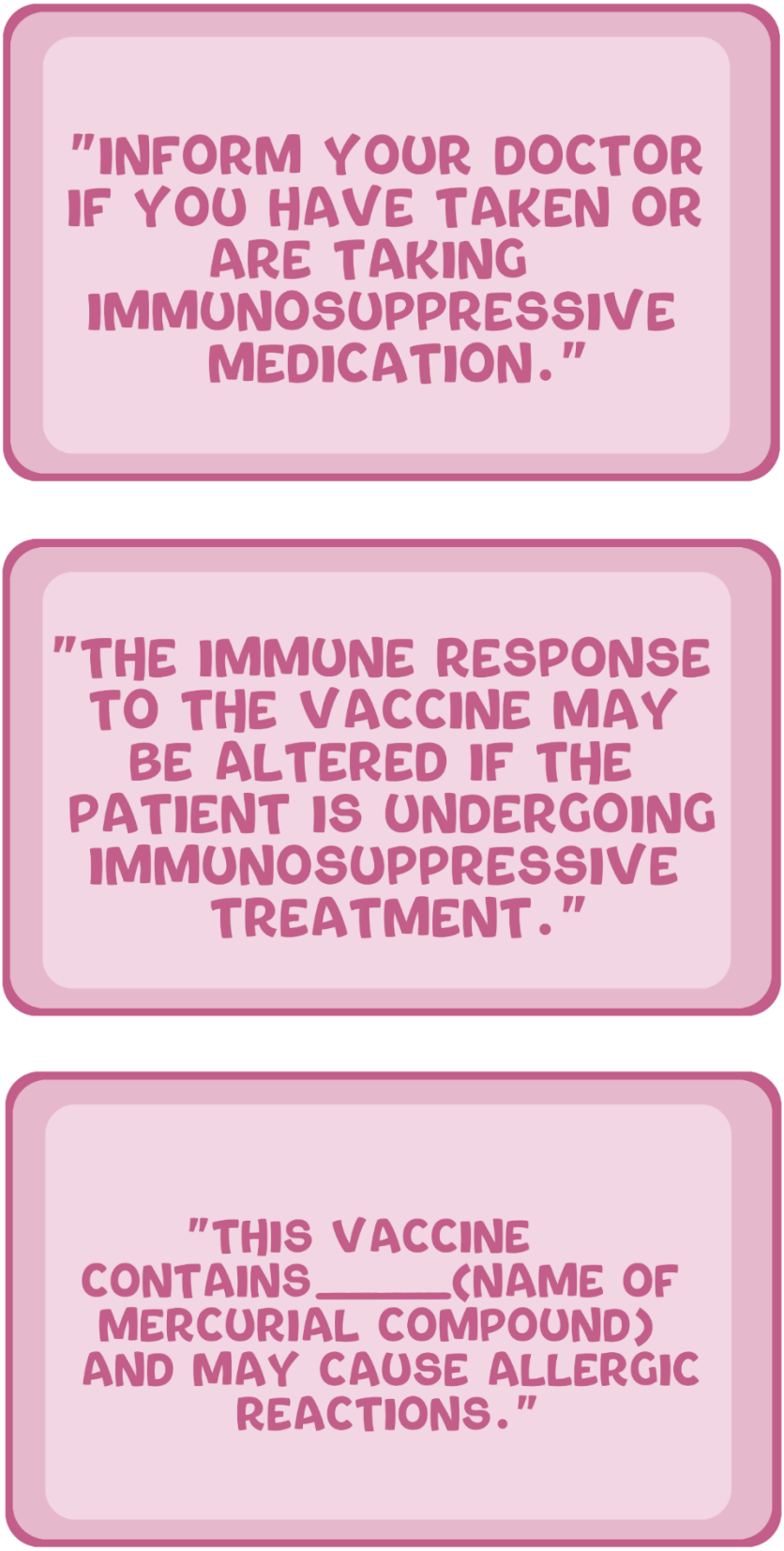
When administered by injection, propylene glycol can cause more pain or irritation at the injection site (Lim et al., 2014). Compared to ethanol, propylene glycol can cause more adverse effects, especially in the brains of newborns, children, pregnant women, and individuals with kidney and liver problems (Lim et al., 2014).

Propylene glycol can also lead to adverse effects such as ear complications, heart issues, seizures, difficulty breathing, and wheezing. The World Health Organization has deemed a daily intake of up to 25 mg/kg/body weight of propylene glycol acceptable. Medications containing 35% propylene glycol can lead to blood problems in children (Lim et al., 2014).

Another commonly used excipient is polyethylene glycol, often labelled as PEG. It is used in medications, vaccines, cosmetics, and processed foods (ultra-processed foods) and can cause allergies, itching, and severe swelling in the face, throat, hands, and feet (Cox et al., 2021). The World Health Organization considers the intake of polyethylene glycol up to 10 mg/kg of body weight as acceptable. However, in intravenous medications, the maximum amount of polyethylene glycol is approximately 30%, and adverse effects on the blood occur when the amount of polyethylene glycol reaches 40% in the medication (Lim et al., 2014).

Medications administered through the vein can therefore cause various adverse effects, including allergies. Leaflets and labels of vaccines need to include warning statements about components that can cause allergies, including egg, propylene glycol, mercury, among others (Anvisa, 2010) (Figure 15). Caregivers of children should be attentive to the adverse effects that vaccines can cause. The yellow fever vaccine and the tetra-viral vaccine (measles, mumps, rubella, and varicella) contain egg in their composition (Anvisa, 2010).

Figure 16 - Warning phrases about vaccine components that can cause allergies



4 INJECTABLE MEDICATIONS WITH RUBBER STOPPERS (LATEX)

Latex can be present in products used in hospitals or at home and can cause some adverse effects, including in healthcare professionals (Bailey; Bastien, 2005; Reines; Seifert, 2005; Hepner; Castells, 2003). Due to its elastic properties, latex can be used in various healthcare products.

Latex is a substance found in natural rubber, extracted from the *Hevea brasiliensis* tree (Bailey; Bastien, 2005). Latex is composed of proteins that can stimulate the production of defence cells (antibodies). If a child develops an allergy upon initial exposure, it's important to be vigilant for more severe allergic reactions (anaphylactic shock).

Regarding medication, latex can be present in the packaging of injectable drugs, such as rubber stoppers or even syringes (plungers). In the general population, about one in every 100 people may have a latex allergy (Draisci et al., 2007; Hepner; Castells, 2003). When it comes to gender, women may have a higher incidence of latex allergy compared to men (Draisci et al., 2007; Hepner; Castells, 2003). It's important to be vigilant about equipment and products that may contain latex (Andreu et al., 2006; Thomsen; Burke, 2000). Medications used for cancer treatment in children can be placed in vials with latex stoppers (Figure 16). This includes methotrexate among these drugs. The child's medical record should include information about latex allergies, and the mother should also inform the healthcare team about any previous allergic reactions.

Figure 17 - Phrase containing medicine with latex cap

5 FOR TOPICAL USE

Medications can be applied to the skin, (topical use) but depending on the substance used, they can have an effect on the child's entire body. An example of a medication applied to a child's skin is an ointment for pain or an emulgel containing diclofenac sodium. Diclofenac sodium is a pain medication. The child's kidney is only fully developed at the age of twelve. If applied to the skin and has an effect on the entire body, it can compromise kidney function. One limitation is identifying that this effect occurred because the product was applied to the skin and not taken orally. Another aspect to consider is that it can be challenging to determine the quantity of this pain medication that was absorbed through the child's skin and led to the adverse effect on the child's kidney.

The caregiver should remain vigilant and inform the doctor about any product that may have been applied to the baby's skin, including diaper rash products.

A baby's skin is very thin (stratum corneum) and it's preferable to use thicker formulations like creams and ointments. Pastes contain a high amount of solid ingredients (around 20%), which helps keep the product on the skin and reduces adverse effects on other organs. A cream is a formulation that contains a high amount of solid products (around 20%) (Anvisa, 2019). This cream keeps the product on the skin and reduces adverse effects on other organs.

Some products applied to the skin, when covered with a dressing, for example, can increase the contact of the medication with the skin and may have adverse effects, as they can be absorbed into the child's bloodstream (Brunton et al., 2019).

Special attention should also be given to formulas containing iodine (as they can alter thyroid function), vaseline with pain medication (salicylates), camphor, and hexachlorophene mercury.

The application of some medications on the skin, due to the higher permeability of a child's skin, can lead to systemic effects, especially under closed dressings or when used for an extended period or over a large area of skin. This is the case with the use of topical corticosteroids, for example. Caution should also be exercised regarding iodine-based formulations, salicylate-containing ointments, camphor, mercury, and hexachlorophene (Wannmacher; Ferreira, 2006).

Another concern is the application of testosterone gel on the skin of parents (Testosterone, 2023). Children may come into contact with the skin with gel when held by their parents. Contact with testosterone can trigger virilization (acne and genital enlargement). Parents should apply it at night on the inner thigh (a location with less contact with children), avoid contact with the child after applying the medication, and take a shower the next day to remove the medication before holding the children (Testosterone, 2023).

6 PREPARATION AND ADMINISTRATION PRECAUTIONS

When it's necessary to measure the dose of the medication, preferably use the small cups, dosing spoons, syringes, and other measuring devices that come with the medication packaging. Avoid using household utensils because their measurements can be imprecise. The sizes of regular spoons, cups, and other containers can vary in volume, affecting the quantity of medication taken (Hill, 2005; Piñeiro-Carrero; Piñeiro, 2004) (Figura 17).

Figure 18 - Measuring cup, measuring spoons and syringe

REFERENCES

Agência Nacional de Vigilância Sanitária. Informe Técnico nº 30, de 24 de julho de 2007. Considerações sobre o corante amarelo tartrazina [Internet]. Brasília: Anvisa; 2007 [cited 2023 out. 16]. Available from: https://www.gov.br/agricultura/pt-br/assuntos/inspecao/produtos-vegetal/legislacao-de-produtos-origem-vegetal/biblioteca-de-normas-vinhos-e-bebidas/informe-tecnico-no-30-de-24-de-julho-de-2007_anvisa.pdf/view

Agência Nacional de Vigilância Sanitária. Farmacopeia brasileira: volume II – monografias insumos farmacêuticos e especialidades [Internet]. 6. ed. Brasília: Anvisa; 2019 [cited 2023 jun. 10]. Available from: https://www.gov.br/anvisa/pt-br/assuntos/farmacopeia/farmacopeia-brasileira/6a-edicao-volume-2

Agência Nacional de Vigilância Sanitária. Resolução - RDC nº 60, de 17 de dezembro de 2010. Estabelece frases de alerta para princípios ativos e excipientes em bulas e rotulagem de medicamentos [Internet]. Brasília: Anvisa; 2010 [cited 2023 out. 16]. Available from: https://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2010/res0060_17_12_2010.html

Agência Nacional de Vigilância Sanitária. Resolução - RDC nº 770, de 12 de dezembro de 2022. Estabelece frases de alerta para substâncias, classes terapêuticas e listas de controle em bulas e embalagem de medicamentos. Diário Oficial da União [Internet]. 2022 dez. 14 [2023 out. 16];234(seção 1):154. Available from: https://www.in.gov.br/en/web/dou/-/resolucao-rdc-n-770-de-12-de-dezembro-de-2022-450308284

Agência Nacional de Vigilância Sanitária. Resolução - RDC nº 802, de 20 de julho de 2023. Dispõe sobre insumos farmacêuticos de uso restrito ou proibido em medicamentos de uso humano. Diário Oficial da União [Internet]. 2023a jul. 21 [cited 2023 out. 16];138(seção 1):103. Available from: https://www.in.gov.br/en/web/dou/-/resolucao-rdc-n-802-de-20-de-julho-de-2023-497852462?utm_campaign=informe_resolucao_rdc_n_8022023__restricao_e_proibicao_de_insumos_em_medicamentos_de_uso_human&utm_medium=email&utm_source=RD+Station

Agência Nacional de Vigilância Sanitária. Resolução - RE nº 1, de 25 de janeiro de 2002. Diário Oficial da União [Internet]. 2002 jan. 28 [2023 out. 16]. Disponíveis em: https://antigo.anvisa.gov.br/documents/10181/2718376/%281%29RE_01_2002_COMP.pdf/22de3815-ff2c-47ac-adfe-5664030c5e0d

Agência Nacional de Vigilância Sanitária. Resolução da Diretoria Colegiada - RDC nº 778, de 1° de março de 2023. Dispõe sobre os princípios gerais, as funções tecnológicas e as condições de uso de aditivos alimentares e coadjuvantes de tecnologia em alimentos. Diário Oficial da União [Internet]. 2023b mar. 8 [cited 2023 out. 16];46. Available from: http://antigo.anvisa.gov.br/documents/10181/6561857/RDC_778_2023_.pdf/a89bb838-62e4-4471-a28f-ff28e3e97241#:~:text=Disp%C3%B5e%20sobre%20os%20princ%C3%ADpios%20gerais,que%20lhe%20conferem%20os%20arts

Alcorn J, McNamara PJ. Pharmacokinetics in the newborn. Adv Drug Deliv Rev. 2003 Apr 29;55(5):667-86. doi: 10.1016/s0169-409x(03)00030-9

Andreu JM, Pallardó MA, Herranz A, Rodríguez JM, De Andrés JÁ. Protocolo de adecuación hospitalaria al paciente alergico al latex [Internet]. Valencia: Hospital General Universitaro de Valencia, 2006 [cited 2023 Oct 20]. Available from: https://chguv.san.gva.es/documents/10184/46046/08_protocoloalergialatexavanzado.pdf/5332155f-da5c-41f6-9933-efe20c4cd3e7

Bailey PD, Bastien JL. Intraoperative latex hypersensitivity: do not overlook Penrose drains. J Clin Anesth. 2005;17(6):485-7. https://doi.org/10.1016/j.jclinane.2004.10.009

Balbani APS, Stelzer LB, Montovani JC. Excipientes de medicamentos e as informações da bula. Rev Bras Otorrinolaringol. 2006;72(3):400-6. https://doi.org/10.1590/S0034-72992006000300018

Bartelink IH, Rademaker CM, Schobben AF, van den Anker JN. Guidelines on paediatric dosing on the basis of developmental physiology and pharmacokinetic considerations. Clin Pharmacokinet. 2006;45(11):1077-97. doi: 10.2165/00003088-200645110-00003

Bethea TN, Wesselink AK, Weuve J, McClean MD, Hauser R, Williams PL, et al. Correlates of exposure to phenols, parabens, and triclocarban in the Study of Environment, Lifestyle and Fibroids. J Expo Sci Environ Epidemiol. 2020 Jan;30(1):117-136. doi: 10.1038/s41370-019-0114-9

Brunton LL, Hilal-Dandan R, Knollmann BC. Goodman & Gilman: Las bases farmacológicas de la terapéutica. 13. ed. México: McGraw-Hill; 2019.

Burg FD, Bourret JA. Current pediatric drugs. Philadelphia: Saunders; 1994. p. 135.

Cabaleiro N, de la Calle I, Bendicho C, Lavilla I. An overview of sample preparation for the determination of parabens in cosmetics. TrAC Trends Anal Chem. 2014 May;57:34-46. DOI: https://doi.org/10.1016/j.trac.2014.02.003

Cox F, Khalib K, Conlon N. PEG That Reaction: A Case Series of Allergy to Polyethylene Glycol. J Clin Pharmacol. 2021 Jun;61(6):832-835. doi: 10.1002/jcph.1824

Draisci G, Nucera E, Pollastrini E, Forte E, Zanfini B, Pinto R, et al. Anaphylactic reactions during cesarean section. Int J Obstet Anesth. 2007 Jan;16(1):63-7. doi: 10.1016/j.ijoa.2006.08.006

Dualde P, Pardo O, Corpas-Burgos F, Kuligowski J, Gormaz M, Vento M, et al. Biomonitoring of parabens in human milk and estimated daily intake for breastfed infants. Chemosphere. 2020 Feb; 240:124829. doi: 10.1016/j.chemosphere.2019.124829

Elhkim MO, Héraud F, Bemrah N, Gauchard F, Lorino T, Lambré C, et al. New considerations regarding the risk assessment on Tartrazine An update toxicological assessment, intolerance reactions and maximum theoretical daily intake in France. Regul Toxicol Pharmacol. 2007 Apr;47(3):308-16. doi: 10.1016/j.yrtph.2006.11.004

European Medicines Agency. Committee for Medicinal Products for Human use (CHMP). Reflection paper: formulations of choice for the pediatric population [Internet]. London; 2006 July 28 [cited 2023 Aug 20]. Available from: https://www.ema.europa.eu/en/documents/scientific-guideline/reflection-paper-formulations-choice-paediatric-population_en.pdf

Fiocchi A, Riva E, Giovannini M. Ethanol in medicines and other products intended for children: commentary on a medical paradox. Nutr Res. 1999;19(3):373-79. https://doi.org/10.1016/S0271-5317(99)00004-4

Gershanik J, Boecler B, Ensley H, McCloskey S, George W. The gasping syndrome and benzyl alcohol poisoning. N Engl J Med. 1982 Nov 25;307(22):1384-8. doi: 10.1056/NEJM198211253072206

Giacoia GP, Mattison DR. Selected Proceedings of the NICHD/FDA newborn drug development initiative: Part II. Clin Ther. 2006 Sep;28(9):1337-41. doi: 10.1016/j.clinthera.2006.09.003

Heineck I, Camargo AL, Ferreira MBC. Reações adversas a medicamentos. In: Fuchs FD, Wannmacher L, Ferreira MBC, editores. Farmacologia clínica: fundamentos da terapêutica racional. 3. ed. Rio de Janeiro: Guanabara Koogan; 2006. p. 73-85.

Hepner DL, Castells MC. Latex allergy: an update. Anesth Analg. 2003 Apr;96(4):1219-1229. doi: 10.1213/01.ANE.0000050768.04953.16

Hill P. Off license and off label prescribing in children: litigation fears for physicians. Arch Dis Child. 2005 Feb;90 Suppl 1(Suppl 1):i17-8. doi: 10.1136/adc.2004.058867

"Inactive" ingredients in pharmaceutical products: update (subject review). American Academy of Pediatrics Committee on Drugs. Pediatrics. 1997 Feb;99(2):268-78. doi: 10.1542/peds.99.2.268

Johnson TN. The development of drug metabolizing enzymes and their influence on the susceptibility to adverse drug reactions in children. Toxicology. 2003 Oct 1;192(1):37-48. doi: 10.1016/s0300-483x(03)00249-x

Katzung BG. Farmacologia básica e clínica. 9a ed. Rio de Janeiro: Guanabara Koogan; 2005.

Kearns GL, Abdel-Rahman SM, Alander SW, Blowey DL, Leeder JS, Kauffman RE. Developmental pharmacology--drug disposition, action, and therapy in infants and children. N Engl J Med. 2003 Sep 18;349(12):1157-67. doi: 10.1056/NEJMra035092

Kibbe AH. Handbook of pharmaceutical excipients. 3rd ed. Washington, D.C.: American Pharmaceutical Association; 2000. p. 7-9, 38-413, 146-153, 340-344, 392-398, 454-459, 471-473, 485-486, 490-492, 515-518, 539 – 543.

Klasco RK, editor. DRUGDEX System [Database on the Internet]. Ann Arbor, MI: Merative US L.P.; 2023 [cited 2023 Sep 5]. Available from: http://www.micromedexsolutions.com. Subscription required to view.

Koren G. Aspectos especiais de farmacologia perinatal e pediátrica. *In*: Katzung BG. Farmacologia básica e clínica. 8. ed. Rio de Janeiro: Guanabara Koogan; 2003. p. 889-98.

Labaune JP. Farmacocinética. São Paulo: Andrei; 1993. 200 p.

Lim TY, Poole RL, Pageler NM. Propylene glycol toxicity in children. J Pediatr Pharmacol Ther. 2014 Oct-Dec;19(4):277-82. doi: 10.5863/1551-6776-19.4.277

Little HJ. Alcohol is a drug; a cautionary note on its use as a drug solvent. Psychopharmacology (Berl). 2004 Jan;171(2):234-5. doi: 10.1007/s00213-003-1580-1

Marcovitch H. Safer prescribing for children. BMJ. 2005 Sep 24;331(7518):646-7. doi: 10.1136/bmj.331.7518.646

Mello ED. Prescrição de medicamentos em pediatria. In: Fuchs FD, Wannmacher L, Ferreira MBC, editores. Farmacologia clínica: fundamentos da terapêutica racional. 3. ed. Rio de Janeiro: Guanabara Koogan; 2006. p. 942-8.

Napke E, Stevens DG. Excipients and additives: hidden hazards in drug products and in product substitution. Can Med Assoc J. 1984 Dec 15;131(12):1449-52.

Neves BG, Pierro VSS, Maia LC. Percepções e atitudes de responsáveis por crianças frente ao uso de medicamentos infantis e sua relação com cárie e erosão dentária. Ciênc Saúde Coletiva. 2007;12(5):1295-1300. https://doi.org/10.1590/S1413-81232007000500027

Nowak K, Ratajczak-Wrona W, Górska M, Jabłońska E. Parabens and their effects on the endocrine system. Mol Cell Endocrinol. 2018 Oct 15;474:238-251. doi: 10.1016/j.mce.2018.03.014

Pawar S, Kumar A. Issues in the formulation of drugs for oral use in children: role of excipients. Paediatr Drugs. 2002;4(6):371-9. doi: 10.2165/00128072-200204060-00004

Peiré García MA. Farmacología pediatrátrica. Buenos Aires, AR: Ediciones Journal Sa; 2019.

Peres KG, Oliveira CT, Peres MA, Raymundo MS, Fett R. Sugar content in liquid oral medicines for children. Rev Saude Publica. 2005 Jun;39(3):486-9. doi: 10.1590/s0034-89102005000300022

Pifferi G, Restani P. The safety of pharmaceutical excipients. Il Farmaco. 2003 Aug;58(8):541-50. doi: 10.1016/S0014-827X(03)00079-X

Piñeiro-Carrero VM, Piñeiro EO. Liver. Pediatrics. 2004 Apr;113(4 Suppl):1097-106. PMID: 15060205

Prusakiewicz JJ, Harville HM, Zhang Y, Ackermann C, Voorman RL. Parabens inhibit human skin estrogen sulfotransferase activity: possible link to paraben estrogenic effects. Toxicology. 2007 Apr 11;232(3):248-56. doi: 10.1016/j.tox.2007.01.010

Reines HD, Seifert PC. Patient safety: latex allergy. Surg Clin North Am. 2005 Dec;85(6):1329-40, xiv. doi: 10.1016/j.suc.2005.09.014

Reisch MS. Keeping well-preserved: Cosmetic preservatives makers offer alternatives as widely used parabens come under scrutiny. Chem Eng News. 2005;83(46):25-27.

Renwick AG, Thompson JP, O'Shaughnessy M, Walter EJ. The metabolism of cyclamate to cyclohexylamine in humans during long-term administration. Toxicol Appl Pharmacol. 2004 May 1;196(3):367-80. doi: 10.1016/j.taap.2004.01.013

Rosenfield RL, Cooke DW, Radovick S. Puberty in the female and its disorders. In: Sperling MA, editor. Sperling pediatric endocrinology. 5th ed. Philadelphia: Elsevier; 2020. p. 528-626. DOI: https://doi.org/10.1016/B978-0-323-62520-3.00016-6

Rowe RC, Sheskey PJ, Quinn ME. Handbook of pharmaceutical excipients. 6th ed. London: Pharmaceutical Press; 2009.

Silva P. Farmacologia básica e clínica. 6. ed. Rio de Janeiro: Guanabara Koogan; 2006. p. 1186-96.

Simons SH, Tibboel D. Pain perception development and maturation. Semin Fetal Neonatal Med. 2006 Aug;11(4):227-31. doi: 10.1016/j.siny.2006.02.010

Soffritti M, Belpoggi F, Tibaldi E, Esposti DD, Lauriola M. Life-span exposure to low doses of aspartame beginning during prenatal life increases cancer effects in rats. Environ Health Perspect. 2007 Sep;115(9):1293-7. doi: 10.1289/ehp.10271

Testosterone. In: Micromedex® DRUGDEX® [database on the Internet]. Ann Arbor, MI: Merative US L.P.; 2023 [cited 2023 Sep 5]. Available from: http://www.micromedexsolutions.com. Subscription required to view.

Thomsen DJ, Burke TG. Lack of latex allergen contamination of solutions withdrawn from vials with natural rubber stoppers. Am J Health Syst Pharm. 2000 Jan 1;57(1):44-7. doi: 10.1093/ajhp/57.1.44

Wannmacher L, Ferreira, BC, Antiinflamatórios esteróides. In: Fuchs FD, Wannmacher L, Ferreira MBC, editores. Farmacologia clínica: fundamentos da terapêutica racional. 3. ed. Rio de Janeiro: Guanabara Koogan; 2006. p. 313-14.

World Health Organization. WHO model list of essential medicines for children: 1st list, October 2007 [Internet]. Geneva: World Health Organization; 2007 [cited 2023 Sep 5]. Available from: https://iris.who.int/handle/10665/70659

Yilmaz O, Cochrane B, Wildgoose J, Pinto A, Evans S, et al. Phenylalanine free infant formula in the dietary management of phenylketonuria. Orphanet J Rare Dis. 2023 Jan 25;18(1):16. doi: 10.1186/s13023-023-02621-9

Yorgin PD, Theodorou AA, Al-Uzri A, Davenport K, Boyer-Hassen LV, Johnson MI. Propylene glycol-induced proximal renal tubular cell injury. Am J Kidney Dis. 1997 Jul;30(1):134-9. doi: 10.1016/s0272-6386(97)90577-1

Splitting Antineoplastic Pills

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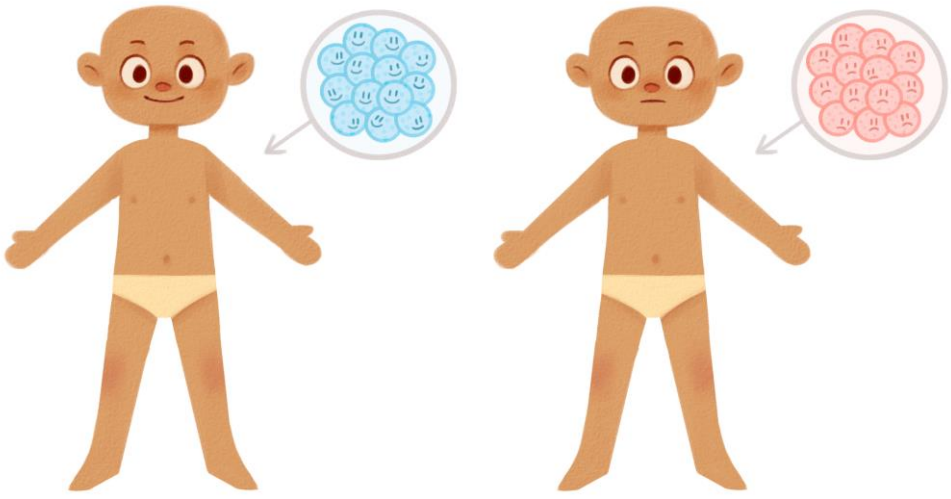
Having cancer means that the cell factory, somewhere in time, started to have problems or make cells in a different size – some of them are unready to leave the factory, therefore causing an imbalance in the child's/teenager's body (Park et al., 2020; Uthamacumaran, 2020). Thus, treatment is necessary to bring everything back to normal. The most common form of cancer in children/teenagers is in the blood, but it may occur in other places (Miller et al., 2020).



Chemotherapy is frequently used for cancer in children and teenagers and can involve various drugs. The drugs affect the growth and multiplication of the cells. To eliminate cancerous cells, the drugs may be used alone or in combination, depending on the type of cancer. The medication to treat cancer can be used through the vein, but it is also common in

a pill. The pills are often used, mainly because they are easy to take, cheaper, and less affected when compared to other forms of medication (Instituto Nacional de Câncer - INCA, 2022a).

Treatment for cancer involves a series of steps. Some are done in the hospital, but others can be done at home, with drugs through the mouth (orally), under the family's responsibility (INCA, 2022b). This stage of the treatment is as valuable as the one given at the hospital to reach the cure and avoid that the cancer comes back (Schmiegelow et al., 2014). The adequate adjustment of the medication's dosage is important so the drug to treat cancer works while the bad effects are not so bad and allows the child to be cured during the treatment (Pui; Evans, 2013).

Sometimes medications in the correct dosage for the children cannot be found. Thus, it is necessary to split the pills. This situation is even more serious regarding cancer treatment, once these medications are considered potentially dangerous and can contaminate the whole family, especially the person who takes care of the sick child (Roos et al., 2021).

Dangerous medications can cause cancer, affect genetics, fertility, pregnancy, and babies who are still in their mother's womb. The medications to treat cancer can have harmful effects on other organs of the body. This also applies to new drugs with a similar effect to others that have already been considered dangerous (National Institute for Occupational Safety and Health - NIOSH, 2016). People who are trying to have children, who are pregnant or breastfeeding, should avoid this kind of medication (Polovich, 2017).

When we talk about children and teenagers, the dosages can vary a lot according to age and treatment. Thus, the adjustment of the dosage to each one is normal and sometimes,

splitting pills is necessary (INCA, 2022a; Bjerknes et al., 2017; Richey et al., 2017; Conroy et al., 2003; Mulla et al., 2016; Andersson et al., 2016).

Splitting pills can alter the dosage up or down (Teixeira et al., 2016), so when splitting (dividing) cannot be avoided, it is important to follow a script to reduce the risk for children, teenagers, and caregivers (Tessmann et al., 2020).

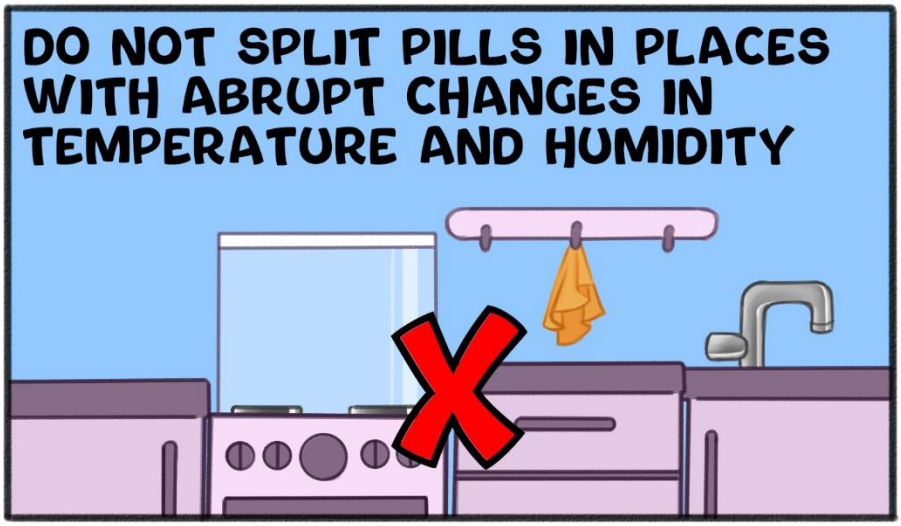
In Brazil, there is no legal rule to be followed on splitting pills. In the United States, there is a rule in which only pills with a groove can be split. This norm helps to have greater certainty in the splitting (Teixeira et al., 2016).

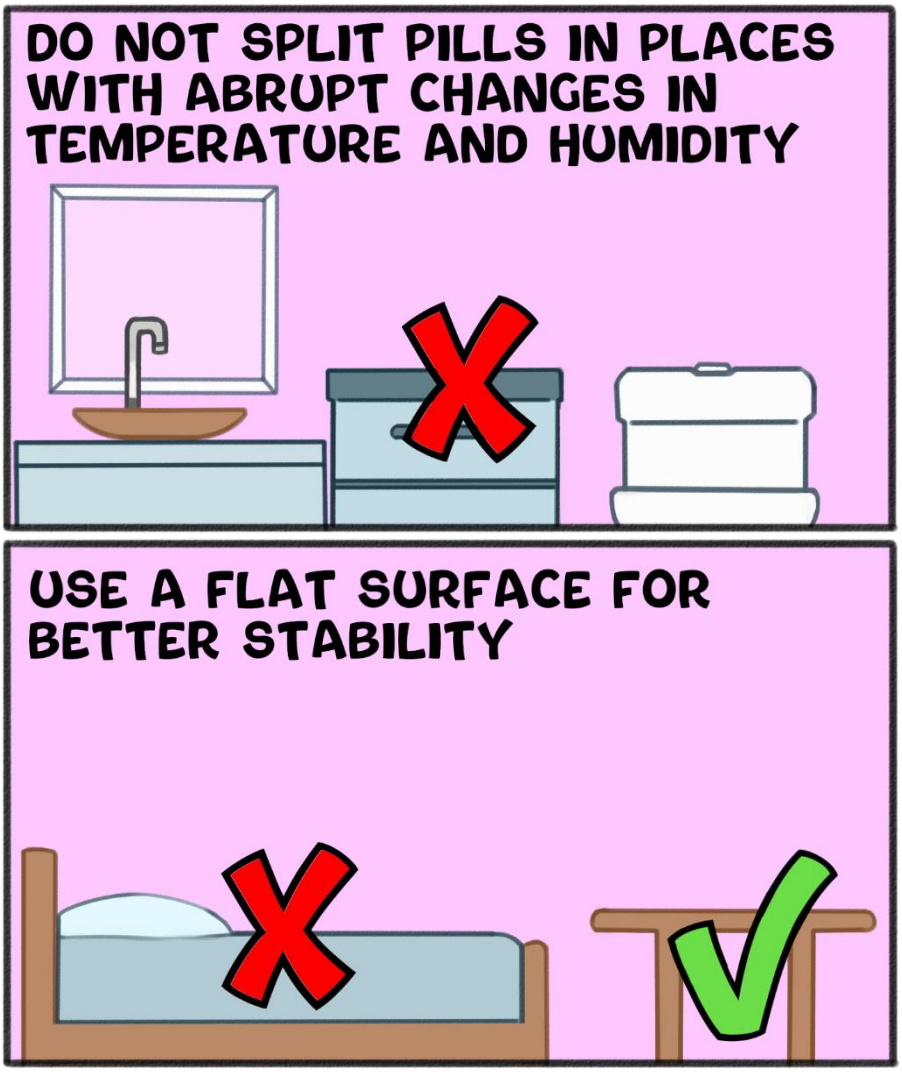
CAUTION WHEN SPLITTING PILLS

As the medications for cancer are dangerous (Instituto para Práticas Seguras no Uso de Medicamentos - ISMP, 2019) and their splitting can leave a powder that can cause bad effects (Mulla et al., 2016), a capable health professional should do it, being careful so the dosage is right and there is no contamination of people and objects. When splitting the pills by a professional is not possible, it may be necessary to split them at home. But some caution must be taken (Tessmann et al., 2020).

Before splitting the pills, it is essential to check the prescription and medical advice.

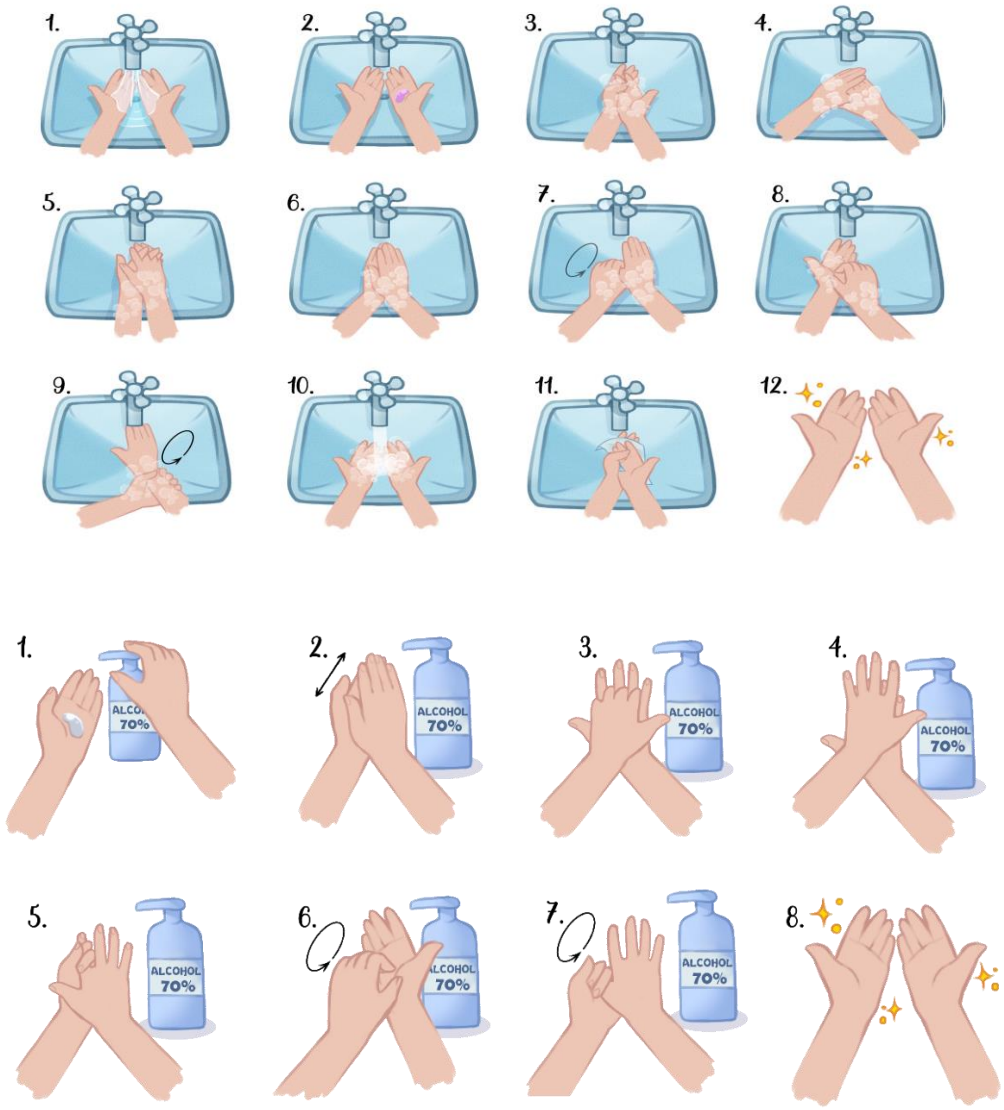
It is also necessary to choose a good place for the splitting. Avoid areas that have abrupt changes in temperature and humidity (such as bathrooms and the kitchen) (Bragalone, 2019). The medications must also stay away from kitchen utensils and other objects in the home (St. Jude Children´s Research Hospital, 2022) since the residues can mix with the food and cause intoxication (Bragalone, 2019; Power; Coyne, 2018). So, in the areas where the medications are administered and manipulated, one should abstain from eating, drinking, and storing food (Power; Coyne, 2018).





The person in charge of splitting the pills must do it on a clean surface, which can be covered with waxed paper (Roos et al., 2021; NIOSH, 2016; Polovich, 2017; Bjerknes et al., 2017; Richey et al., 2017; Conroy et al., 2003; Mulla et al., 2016; Andersson et al., 2016; Tessmann et al., 2020; ISMP, 2019; Bragalone, 2019; Power; Coyne, 2018; St. Jude Children´s Research Hospital, 2022).

Before and after manipulating the medications, hands must be thoroughly washed, dried, and sanitized (alcohol 70% can be used).



It is recommended to use protective gear, as indicated, e.g., gloves, masks, and safety glasses.

Latex gloves or gloves that are torn or punctured must not be used. Disposable nitrile gloves should be used, if possible, because they are more resistant than the ones made of latex and are better for people who are allergic to latex. Gloves help protect the caregivers from the absorption of medications through the skin and should be used every time the medications are handled, except by the child in treatment. Even so, the child or teenager must wash their hands thoroughly with water and soap before and after handling the medications (Roos et al., 2021; St. Jude Children´s Research Hospital, 2022).

The protective masks keep the caregivers from inhaling the medications and can be deemed necessary when splitting or crushing pills. The caregiver must wear the mask as advised by the doctor or pharmacist (Roos et al., 2021; St. Jude Children´s Research Hospital, 2022).

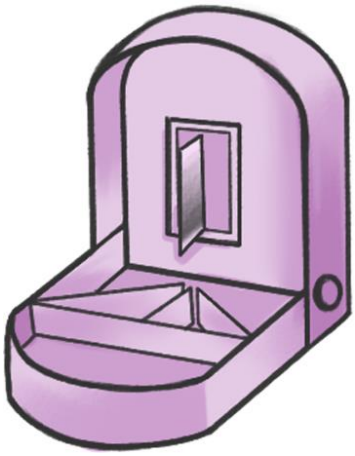
The safety glasses protect the eyes from chemotherapy, especially in the case of medications in liquid form. If there is any chance of spillage, the eyes must be protected (Roos et al., 2021; St. Jude Children´s Research Hospital, 2022).

Pills should not be split at once and be used little by little. When a pill is split, all the pieces must be used before splitting the next one, to avoid harmful effects of heat, humidity, and storage (St. Jude Children´s Research Hospital, 2022).

Elongated, grooved, and safe medication pills are the best to split, but they do not always come this way because they are manufactured in many different forms (St. Jude Children´s Research Hospital, 2022; Helmy, 2015).

Box cutters and kitchen knives should not be used to split pills (Roos et al., 2021). In most cases, a very clean pill cutter is appropriate (Figure 1). This utensil is usually found in drugstores and has a V-shaped holder to center the pills and a blade that cuts. But, in some cases, there may be better choices than this instrument, as when the pills have different forms and sizes or are very brittle (Shah et al., 2010; Food and Drug Administration – FDA, 2013).

Figure 1 - Pill cutter



Some medications should not be split because they may lose their expected effects (Tessmann et al., 2020), i.e., the good effect of the medication to treat cancer. Amongst the medications to treat cancer that cannot be split are drugs that have effects over a long time (extended-release medications), capsules filled with liquid or grains, pills that do not have two equal sides (asymmetric pills), or ones that a very small (Cleveland Clinic, 2022). The health professional can recommend the best method to split the pills (FDA, 2013).

The hygiene in the splitting process is also essential because very thin powder can be aspirated through the nose, skin, or mouth (Teixeira et al., 2016; Roos et al., 2021; Bragalone, 2019; Power; Coyne, 2018; NIOSH, 2004). Rules for cleaning must be established to keep everyone's safety (Böhlandt et al., 2017). After splitting the pills, the cutter must be cleaned with disposable material and stored in a safe place (Roos et al., 2021).

After the split, it is better to use a cup than the hand to give the medication (FDA, 2013).

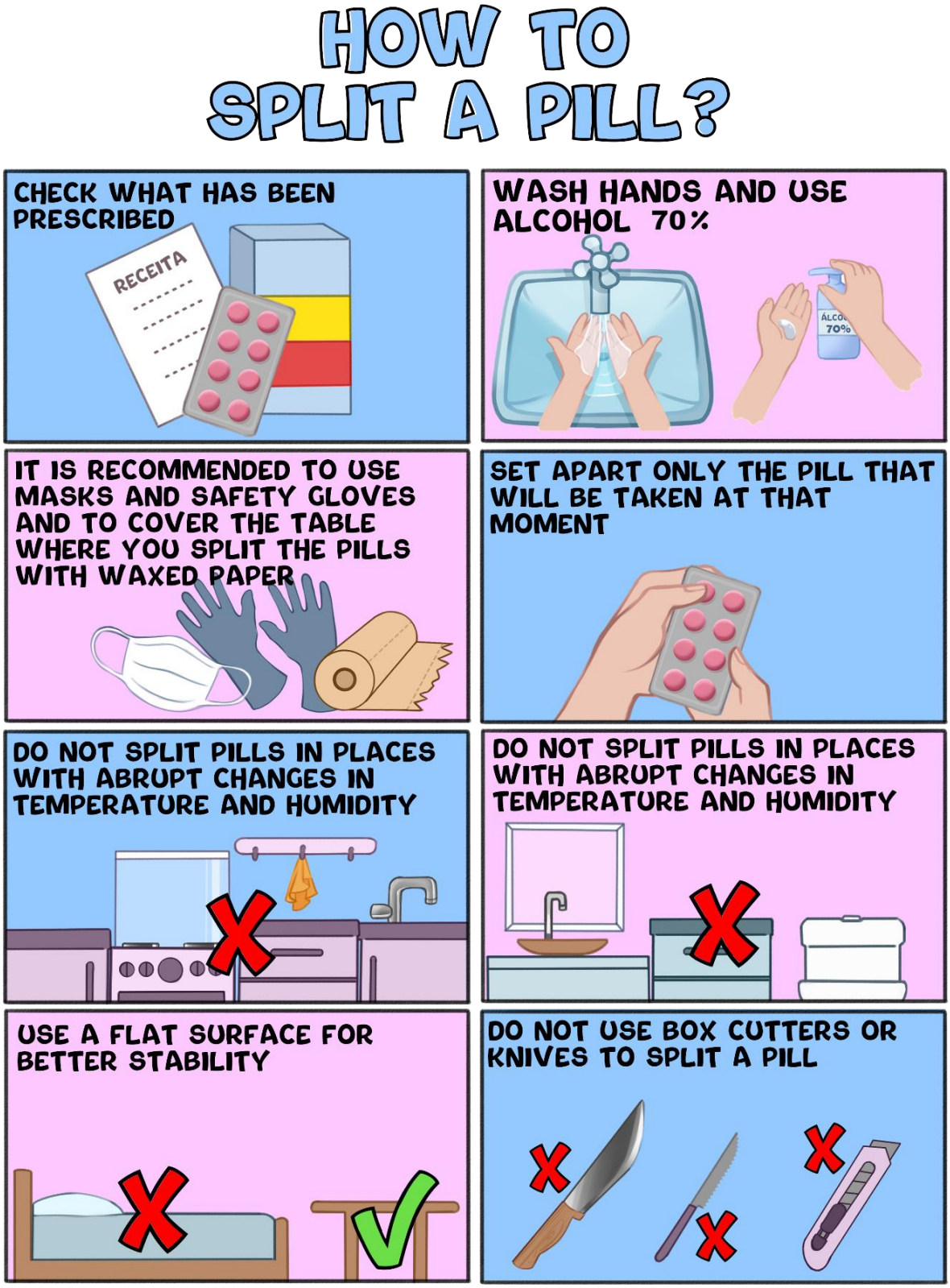
When the pills are taken from the original packaging, they can begin to go bad (Marriott; Nation, 2002). Besides, when the pills are stored together, they may start to crumble if they hit each other (Shah et al., 2010).

One of the most important things to be careful with is to expose the medications as little as possible to light and humidity (Marriott; Nation, 2002). So, it is not recommended to keep the piece left in the pill cutter or other containers (Shah et al., 2010; Borja-Oliveira, 2013).

Some studies say that it is possible to use the packaging of the medication (Shah et al., 2010; Borja-Oliveira, 2013), but the other half of the pill can also be wrapped in cotton in an exclusive pill organizer (Roos et al., 2021).

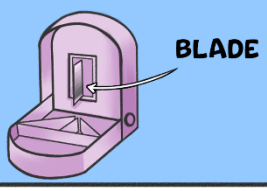
Overall, it is important to remember that these materials should not be disposed of in general waste. The items should be put in a bag and taken for disposal in the hospital in your next appointment (Roos et al., 2021).

To sum up, here is the information and the necessary caution to safely split the pills of drugs for cancer (Roos et al., 2021):

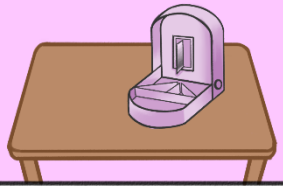


HOW TO SPLIT A PILL?

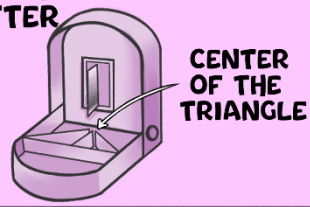
THE BEST WAY TO SPLIT A PILL S BY USING A CLEAN PILL CUTTER WITH AN APPROPRIATE BLADE



WHEN USING A CUTTER, PUT IT ON A FLAT SURFACE TO ENSURE STABILITY



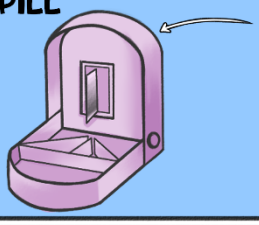
IF THE PILL DOES NOT HAVE A GROOVE, HOLD IT IN THE CENTER OF THE TRIANGLE IN THE CUTTER



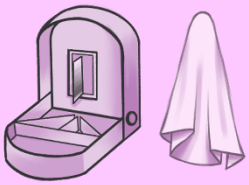
IF THERE IS A GROOVE, CENTER THE BLADE ON THE GROOVE.

THE GROOVE MAKES IT EASIER TO SPLIT THE PILL

CLOSE THE UPPER PART OF THE CUTTER AND PUSH IT TO SPLIT THE PILL

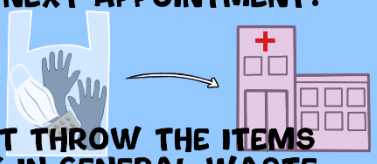


AFTER SPLITTING, CLEAN THE CUTTER WITH WET PAPER OR TISSUE



KEEP THE OTHER HALF OF THE PILL WRAPPED IN COTTON IN A PILL ORGANIZER EXCLUSIVELY SELECTED FOR THAT

PUT ALL THE ITEMS IN A BAG AND TAKE THEM TO THE HOSPITAL FOR DISPOSAL IN YOUR NEXT APPOINTMENT.



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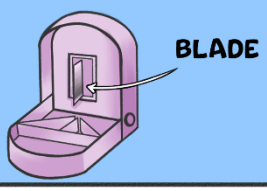

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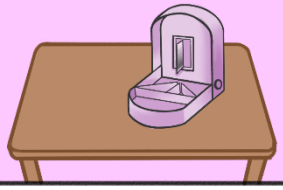

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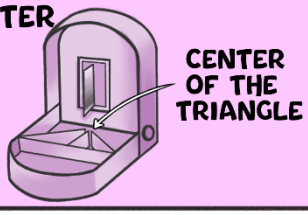

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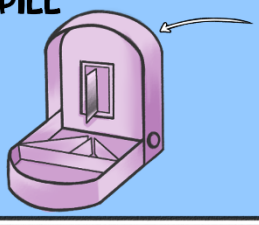

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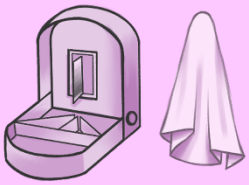

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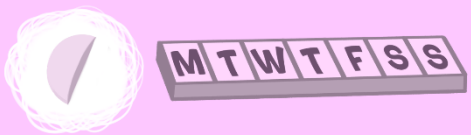

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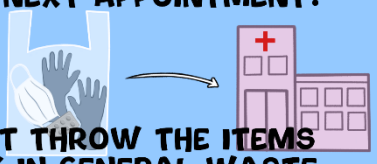

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REFERENCES

Andersson AC, Lindemalm S, Eksborg S. Dividing the tablets for children-good or bad? Pharm Methods. 2016;7(1):23-7. DOI: 10.5530/phm.2016.7.4

Bjerknes K, Bøyum S, Kristensen S, Brustugun J, Wang S. Manipulating tablets and capsules given to hospitalised children in Norway is common practice. Acta Paediatr. 2017 Mar;106(3):503-508. doi: 10.1111/apa.13700

Böhlandt A, Sverdel Y, Schierl R. Antineoplastic drug residues inside homes of chemotherapy patients. Int J Hyg Environ Health. 2017;220(4):757-765. doi: https://doi.org/10.1016/j.ijheh.2017.03.005

Borja-Oliveira CR. Pill organizers and pill cutters: risks and limitations. Rev Saude Publica. 2013 Feb;47(1):123-7. English, Portuguese. doi: 10.1590/s0034-89102013000100016

Bragalone DL. Drug information handbook for oncology. 16th ed. Hudson, OH: Wolters Kluwer; 2019.

Cleveland Clinic. Is it safe to split pills? March 6, 2022 [cited 2023 Oct 10]. Available from: https://health.clevelandclinic.org/cutting-pills-in-half/

Conroy S, Newman C, Gudka S. Unlicensed and off label drug use in acute lymphoblastic leukaemia and other malignancies in children. Ann Oncol. 2003;14(1):42-7. doi: 10.1093/annonc/mdg031

El-Baseir M, El-Basir H. Divisibility of tablets using different splitter models: 0141. Int J Pharm Pract. 2013;21(Suppl 2):107-108. doi: https://doi.org/10.1111/ijpp.12064

Helmy SA. Tablet splitting: is it worthwhile? Analysis of drug content and weight uniformity for half tablets of 16 commonly used medications in the outpatient setting. J Manag Care Spec Pharm. 2015 Jan;21(1):76-86. doi: 10.18553/jmcp.2015.21.1.76

Instituto Nacional de Câncer José Alencar Gomes da Silva. Câncer infanto-juvenil [Internet]. Rio de Janeiro: INCA; 2022 jun. 4 [atualizado em 2023 jan. 13; citado 2023 nov. 23]. Available from: https://www.inca.gov.br/tipos-de-cancer/cancer-infantojuvenil

Instituto Nacional de Câncer José Alencar Gomes da Silva. Leucemia [Internet]. Rio de Janeiro: INCA; 2022 jun. 4 [atualizado em 2022 jul. 18; citado 2023 nov. 23]. Available from: https://www.gov.br/inca/pt-br/assuntos/cancer/tipos/leucemia

Instituto para Práticas Seguras no Uso de Medicamentos. Medicamentos potencialmente perigosos de uso hospitalar – lista atualizada 2019. Boletim ISMP Brasil [Internet]. 2019 [cited 2023 out. 10];8(1):3-9. Available from: https://www.ismp-brasil.org/site/wp-content/uploads/2019/02/615-boletim-ismp-fevereiro-2019.pdf

Marriott JL, Nation RL. Splitting tablets. Aust Prescr. 2002;25(6):133-5. doi: 10.18773/austprescr.2002.131

Miller KD, Fidler-Benaoudia M, Keegan TH, Hipp HS, Jemal A, Siegel RL. Cancer statistics for adolescents and young adults, 2020. CA Cancer J Clin. 2020;70(6):443-459. doi: 10.3322/caac.21637

Mulla H, Buck H, Price L, Parry A, Bell G, Skinner R. 'Acceptability' of a new oral suspension formulation of mercaptopurine in children with acute lymphoblastic leukaemia. J Oncol Pharm Pract. 2016;22(3):387-95. doi: 10.1177/1078155215577808

National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Department of Health and Human Services. NIOSH list of antineoplastic and other hazardous drugs in healthcare settings, 2016 [Internet]. Cincinnati, OH: NIOSH; 2016 [cited 2020 Feb 6]. Available from: https://www.cdc.gov/niosh/docs/2016-161/pdfs/2016-161.pdf

National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Department of Health and Human Services. NIOSH Alert: preventing occupational exposure to antineoplastic and other hazardous drugs in health care settings [Internet]. Cincinnati, OH: NIOSH; 2004 [cited 2023 Nov 23]. Available from: https://www.cdc.gov/niosh/docs/2004-165/pdfs/2004-165.pdf

Park JH, Pyun WY, Park HW. Cancer metabolism: phenotype, signaling and therapeutic targets. Cells. 2020 Oct 16;9(10):2308. doi: 10.3390/cells9102308

Polovich M A. Hazardous drugs and reproductive effects: understanding the risks. Oncol Nurs News [Internet]. 2017 [cited 2023 Nov 14];12(5). Available from: https://www.oncnursingnews.com/view/hazardous-drugs-and-reproductive-effects-understanding-the-risks

Power LA, Coyne JW. ASHP guidelines on handling hazardous drugs. Am J Health Syst Pharm. 2018;75(24):1996-2031. doi: 10.2146/ajhp180564.

Pui CH, Evans WE. A 50-year journey to cure childhood acute lymphoblastic leukemia. Semin Hematol. 2013;50(3):185-96. doi: 10.1053/j.seminhematol.2013.06.007

Richey RH, Hughes C, Craig JV, Shah UU, Ford JL, Barker CE, et al. A systematic review of the use of dosage form manipulation to obtain required doses to inform use of manipulation in paediatric practice. Int J Pharm. 2017;518(1-2):155-66. doi: 10.1016/j.ijpharm.2016.12.032

Roos MLM, Figueiredo ACF, Cunha Filho M, Meireles CG, Medeiros-Souza P. Partição de comprimidos antineoplásicos em crianças: uma visão do cuidador. In: Anais da 20ª Jornada Científica do Hospital Universitário de Brasília [Internet]; 2021; Brasília. Brasília: HUB-UnB; 2021 [cited 2023 nov. 13]. ISBN 978-65-5941-492-5. Available from: https://www.even3.com.br/anais/20jornadacientificadohub/425581-particao-de-comprimidos-antineoplasicos-em-criancas--uma-visao-do-cuidador/

Schmiegelow K, Nielsen SN, Frandsen TL, Nersting J. Mercaptopurine/Methotrexate maintenance therapy of childhood acute lymphoblastic leukemia: clinical facts and fiction. J Pediatr Hematol Oncol. 2014;36(7):503-17. doi: 10.1097/MPH.0000000000000206

Shah RB, Collier JS, Sayeed VA, Bryant A, Habib MJ, Khan MA. Tablet splitting of a narrow therapeutic index drug: a case with levothyroxine sodium. AAPS Pharm Sci Tech. 2010;11(3):1359-67. doi: 10.1208/s12249-010-9515-8

St. Jude Children´s Research Hospital. Safe handling of oral chemotherapy drugs at home. Reviewed: October 2022 [cited 2023 Oct 10]. Available from: https://together.stjude.org/en-us/diagnosis-treatment/medication-management/safe-handling-chemotherapy.html

Teixeira MT, Sá-Barreto LCL, Silva DLM, Cunha-Filho MSS. Panorama dos aspectos regulatórios que norteiam a partição de comprimidos. Rev Panam Salud Publica. 2016;39(6):372-77.

Teixeira MT. Avaliação da influência de múltiplos fatores envolvidos na partição de comprimidos [dissertação na Internet]. Brasília: Faculdade Ciências da Saúde, Universidade de Brasília; 2015 [cited 2023 out. 10]. Available from: http://www.realp.unb.br/jspui/bitstream/10482/20234/3/2015_MairaTelesTeixeira.pdf

Tessmann L, Medeiros-Souza P, Córdoba JCM, Tavares NUL, Abílio VM, Matos DO, Magalhães IMQS. Partição de Comprimidos Antineoplásicos Utilizados no Tratamento de Leucemias Agudas em Crianças e Adolescentes. Rev Bras Cancerol [Internet]. 2020 [cited 2023 out. 10];66(2):e-01764. Available from: https://rbc.inca.gov.br/index.php/revista/article/view/764

U.S. Food and Drug Administration. Best practices for tablet splitting. Silver Spring, MD: FDA; 2013 Aug 23 [cited 2023 Nov 20]. Available from: http://www.fda.gov/Drugs/ResourcesForYou/Consumers/BuyingUsingMedicineSafely/EnsuringSafeUseofMedicine/ucm184666.htm

Uthamacumaran A. Cancer: a turbulence problem. Neoplasia. 2020 Dec;22(12):759-769. doi: 10.1016/j.neo.2020.09.008

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