



Co-funded by the  
Erasmus+ Programme  
of the European Union

# **3D PROCEDURES MANUAL INCLUDED IN THE APP ARSIM2CARE**

Edited by

**Leticia San Martín-Rodríguez**

**Nelia Soto-Ruiz**

**Tomás Ballesteros Egüés**

**Paula Escalada-Hernández**



Co-funded by the  
Erasmus+ Programme  
of the European Union

*Manual developed as intellectual output from the Project ARSim2Care funded by the Program  
Erasmus + of the European Union.*

<http://www.arsim2care.com/>

The Project is developed in collaboration with three European higher education institutions,  
Escola Superior de Enfermagem de Coimbra (ESEnC), Erasmushogeschool Brussel (EhB) and  
Public University of Navarre (UPNA) and the company Industrial Augmented Reality (iAR).



Escola Superior de  
Enfermagem de Coimbra



erasmus  
HOGESCHOOL BRUSSEL



upna  
Universidad Pública de Navarra  
Nafarroako Unibertsitate Publikoa

September 2019

3D Procedures Manual Included in the App Arsim2care

Text © The Editors 2019

First Edition 2019

ISBN 978-84-09-18974-8

This work is published under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) (<https://creativecommons.org/licenses/by-nc-nd/4.0/>). This license allows to share, copy and redistribute the material for non-commercial purposes and giving credit to the original authors and the source, providing a link to the Creative Commons license.

License: CC BY-NC-ND 4.0



---

**Suggested citation:** San Martín-Rodríguez, L., Soto-Ruiz, N., Ballesteros-Egüés, T. & Escalada-Hernández, P. (Eds.) (2019). 3D Procedures Manual Included in the App Arsim2care. Available at <https://hdl.handle.net/2454/37349>. Licensed under a a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).

# TABLE OF CONTENTS

<b>ANATOMICAL STRUCTURES</b> .....	5
CHAPTER 1. Key Anatomical Structures for the Procedures .....	6
Structures in trunk .....	8
Structures in pelvic region.....	10
Structures in wrist .....	12
<b>PROCEDURES</b> .....	14
CHAPTER 2. Endotracheal Intubation.....	15
Procedure in English: Endotracheal Intubation .....	16
Procedure in Spanish: Intubación Endotraqueal.....	23
Procedure in Portuguese: Entubação Endotraqueal.....	30
Procedure in Netherlands: Endotracheale Intubatie .....	37
CHAPTER 3. Arterial Blood Sample.....	44
Procedure in English: Arterial Blood Sample.....	45
Procedure in Spanish: Muestra de Sangre Arterial .....	55
Procedure in Portuguese: Colheita De Sangue Arterial .....	65
Procedure in Netherlands: Arterieel Bloedgas.....	75
CHAPTER 4. Intramuscular Injection .....	85
Procedure in English: Intramuscular Injection .....	86
Procedure in Spanish: Inyección Intramuscular .....	91
Procedure in Portuguese: Injeção Intramuscular.....	97
Procedure in Netherlands: Intramusculaire Injectie .....	103
CHAPTER 5. Nasogastric Tube Insertion.....	109
Procedure in English: Nasogastric Tube Insertion.....	110
Procedure in Spanish: Sondaje nasogástrico .....	116
Procedure in Portuguese: Inserção de Sonda Nasogástrica .....	122

Procedure in Nederlands: Nasogastrische Intubatie .....	129
CHAPTER 6. Suctioning Via a Tracheostomy Tube .....	135
Procedure in English: Suctioning Via a Tracheostomy Tube .....	136
Procedure in Spanish: Aspiración de secreciones por cánula de traqueostomía .....	140
Procedure in Portuguese: Aspiração de Secreções por Cânula de Traqueostomia .....	145
Procedure in Nederlands: Apiratie Via Tracheostomie .....	150
ANNEX .....	155
Annex 1: PDF with 3D content- Instructions for use .....	156

## TABLE OF FIGURES

Figure 1. Structures in trunk.....	8
Figure 2. Structures in pelvic region.....	10
Figure 3. Structures in WRIST.....	12

# CONTRIBUTORS

**Tomás Ballesteros Egüés** IE, MEng, PhD

Assistant professor  
Department of Engineering  
Public University of Navarre  
Pamplona, Navarra, SPAIN

**Imgard Coppens** RN, MSc

Lecturer- Researcher. Coordinator Brussels Integrated Care Simulatiecentrum  
Departement Gezondheidszorg & Landschapsarchitectuur - Verpleegkunde  
Erasmus Hogeschool Brussel  
Brussels, BELGIUM

**Maria da Conceição Giestas Baía Saraiva** RN, MS, PhD

Adjunct Professor, Medical-Surgical Nursing  
Nursing School of Coimbra  
Coimbra, PORTUGAL

**Paula Escalada Hernández** RN, MSc, PhD

Assistant professor  
Department of Health Sciences  
Public University of Navarre  
Pamplona, Navarra, SPAIN

**Luís Leitão Sarnadas** RN, MS, PhD

Adjunct Professor, Medical-Surgical Nursing  
Nursing School of Coimbra  
Coimbra, Portugal

**Rui Carlos Negrão Baptista** RN, MS, PhD

Adjunct Professor, Medical-Surgical Nursing  
Nursing School of Coimbra  
Coimbra, Portugal

**Verónica Rita Dias Coutinho** RN, PhD

Adjunct Professor, Medical-Surgical Nursing  
Nursing School of Coimbra  
Coimbra, Portugal

**Leticia San Martín Rodríguez** RN, MSc, MRes, PhD

Associate professor  
Department of Health Sciences  
Public University of Navarre  
Pamplona, Navarra, SPAIN

**Nelia Soto Ruiz** RN, PhD

Assistant professor

Department of Health Sciences

Public University of Navarre

Pamplona, Navarra, SPAIN

**Sandra Tricas-Sauras**, RN, MSc, MRes, PhD

International Academic Coordinator

Departement Gezondheidszorg & Landschapsarchitectuur - Verpleegkunde

Erasmus Hogeschool Brussel

Brussels, BELGIUM

# PREFACE

This manual has been developed within the “ARsim2care: Augmented reality application in clinical simulation” Project funded by the European Union Erasmus + Program, and it is one of the project’s intellectual outputs. The Project has been developed working with three European higher education institutions, Escola Superior de Enfermagem de Coimbra (ESEnfC), Erasmushogeschool Brussel (EhB) and the Public University of Navarre (UPNA), and the Industrial Augmented Reality (iAR) company. The main aim of this project is to develop an Augmented Reality (AR) software that, combined with clinical simulation anatomical models, lets students work on technical skills for performing invasive clinical procedures, helping them visualise internal anatomical structures (App ARsim2care).

When training Health Science students, technical skills are learnt using what are known as “low fidelity simulation”. Consequently, to enable training on a range of techniques and invasive procedures,<sup>1</sup> anatomical models are used that reproduce part of the human body on which students can perform this technique or procedure. In this way, the student gets similar practice to classroom practicals in a safe and controlled context.

Most of these invasive procedures require precise knowledge of internal anatomical structures. So, when students learn invasive procedures on these anatomical models, they need to imagine these structures. Consequently, the chance to visualise these internal structures will improve understanding of the techniques and can provide significant added value to learning. It is precisely this visualisation of the anatomical structures in the anatomical models what AR offers via the ARsim2care app. AR technology combines reality with virtual images.

The procedures compiled in this manual are included in the ARSim2Care App: **endotracheal intubation, arterial blood sampling, intramuscular injection, nasogastric tube insertion and suctioning via a tracheostomy tube**. This manual includes the detailed description of each procedure, as well as illustrating the key internal anatomical structures to be visualised by the student during their work. This information is not only presented in English but also in the project partners’ languages: Spanish, Portuguese and Dutch.

The manual comes in a PDF electronic version with 3D content in an attempt to include 3D images to look at the figures interactively from the different anatomical views that have been included.

---

<sup>1</sup> This means that these techniques “invade” the body using needles, catheters or other medical devices.



The information in this manual is structured into two sections: Section 1 illustrates key anatomical structures for different procedures, including 3D views of the abdomen, pelvic area and forearm. These images are the same as included in the ARsim2care App. Section 2 gives details of protocols for performing each procedure based on the available evidence: endotracheal intubation, arterial blood sample, intramuscular injection, nasogastric tube insertion and suctioning via a tracheostomy tube. Thus, each chapter in this section presents information on defining the procedure, its therapeutic indications and contraindications, required materials, procedure stages and its potential complications or any aspects to be considered.

To write each chapter, the project team members performed an exhaustive review of the most recent international evidence, in addition to compiling specific protocols used at partner universities. Each procedure was subject to the analysis and the consensus search among all the higher education centres. This made it possible to include the common points for performing invasive clinical procedures, while maintaining the necessary flexibility for each country's specific features, which will make it easier to include it in the training syllabus for students at each institution.

It is hoped that this manual, compiling technical skills associated with procedures included in the ARsim2care project, improves understanding of the skills and knowledge that the student must acquire in each of the procedures included in the project. This analysis and exhaustive study will enrich the teaching-learning process for the technique by using the application.

*As an intellectual output generated by a project funded by the Erasmus+ Programme, the digital version of this manual is free access and it is available for download from the project website:*

<http://www.arsim2care.com/>

Paula Escalada-Hernández  
Leticia San Martín-Rodríguez  
Nelia Soto-Ruiz  
Tomás Ballesteros-Egüés

# SECTION 1:

---

# Anatomical Structures

---

# CHAPTER 1

## Key Anatomical Structures for the Procedures

---

*Tomas Ballesteros-Egüés, Leticia San Martín-Rodríguez, Nelia Soto-Ruiz &  
Paula Escalada-Hernández*

This chapter illustrates the key anatomical structures for the different procedures. Three 3D images show anatomical views of trunk, pelvic region and wrist (Figures 1, 2 and 3). These 3D displays enable an interactive observation and includes information labels, and the visualization from different views (i.e. front, back and side views).

**This chapter includes 3D content. The use of the Adobe Acrobat Reader® software is recommended for the correct visualization of the 3D images in this chapter. When you open a PDF with 3D content, it is necessary to enable 3D content in the current document. The instructions for enabling the option “playing 3D content” and for manipulating the 3D images are in ANNEX 1.**

## Structures in trunk

---

Figure 1 presents those anatomical structures involved in the performance of the procedures of endotracheal intubation, suctioning via a tracheostomy tube and nasogastric tube insertion.

Click on the icons to review each procedure:



Endotracheal  
intubation



Suctioning via a  
tracheostomy  
tube



Nasogastric  
tube  
insertion

FIGURE 1. STRUCTURES IN TRUNK



The structures that can be observed in Figure 1 include:

	<b>ENGLISH</b>	<b>SPANISH</b>	<b>PORTUGUESE</b>	<b>NEDERLANDS</b>
1	Windpipe	Tráquea	Traquéia	Luchtpijp
2	Bronchia	Bronquios	Brônquios	Luchtpijpvertakkingen
3	Lungs	Pulmones	Pulmões	Longen
4	Esophagus	Esófago	Esôfago	Slokdarm
5	Stomach	Estómago	Estômago	Maag

## Structures in pelvic region

---

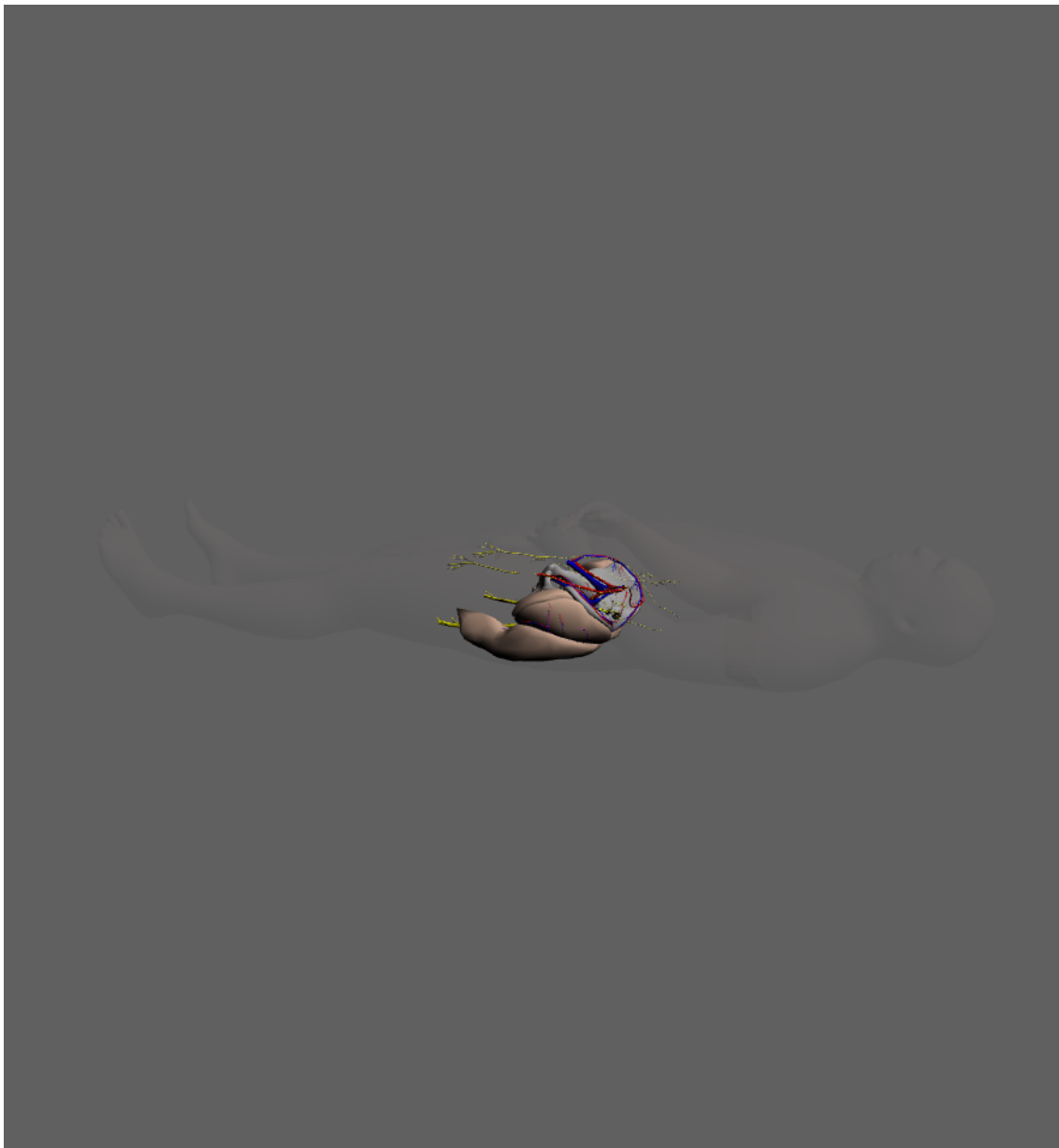
Figure 2 presents those anatomical structures involved in the performance of the procedure of intramuscular injection.

Click on the icon to review the procedure:



**Intramuscular injection**

**FIGURE 2. STRUCTURES IN PELVIC REGION**



The structures that can be observed in Figure 2 include:

	<b>ENGLISH</b>	<b>SPANISH</b>	<b>PORTUGUESE</b>	<b>NEDERLANDS</b>
1	Gluteus maximus muscle	Músculo glúteo mayor	Músculo glúteo máximo	Gluteus maximus spier
2	Gluteus medius muscle	Músculo glúteo medio	Músculo glúteo médio	Gluteus medius spier
3	Ischiatic nerve	Nervio ciático	Nervo ciático	Ischiatische zenuw
4	Femoral nerve	Nervio femoral	Nervo femoral	Femorale zenuw
5	Superior gluteal artery and vein	Arteria y vena glútea superior	Artéria e veia glútea superior	Superieure gluteale slagader en ader
6	Inferior gluteal artery and vein	Arteria y vena glútea inferior	Artéria e veia glútea inferior	Inferieure gluteale slagader en ader
7	Sacrum	Sacro	Sacro	Heiligbeen
8	Pelvic girdle	Cintura pélvica	Cintura pélvica	Bekkengordel
9	Iliac crest	Cresta ilíaca	Crista ilíaca	Iliac crest



## Structures in wrist

---

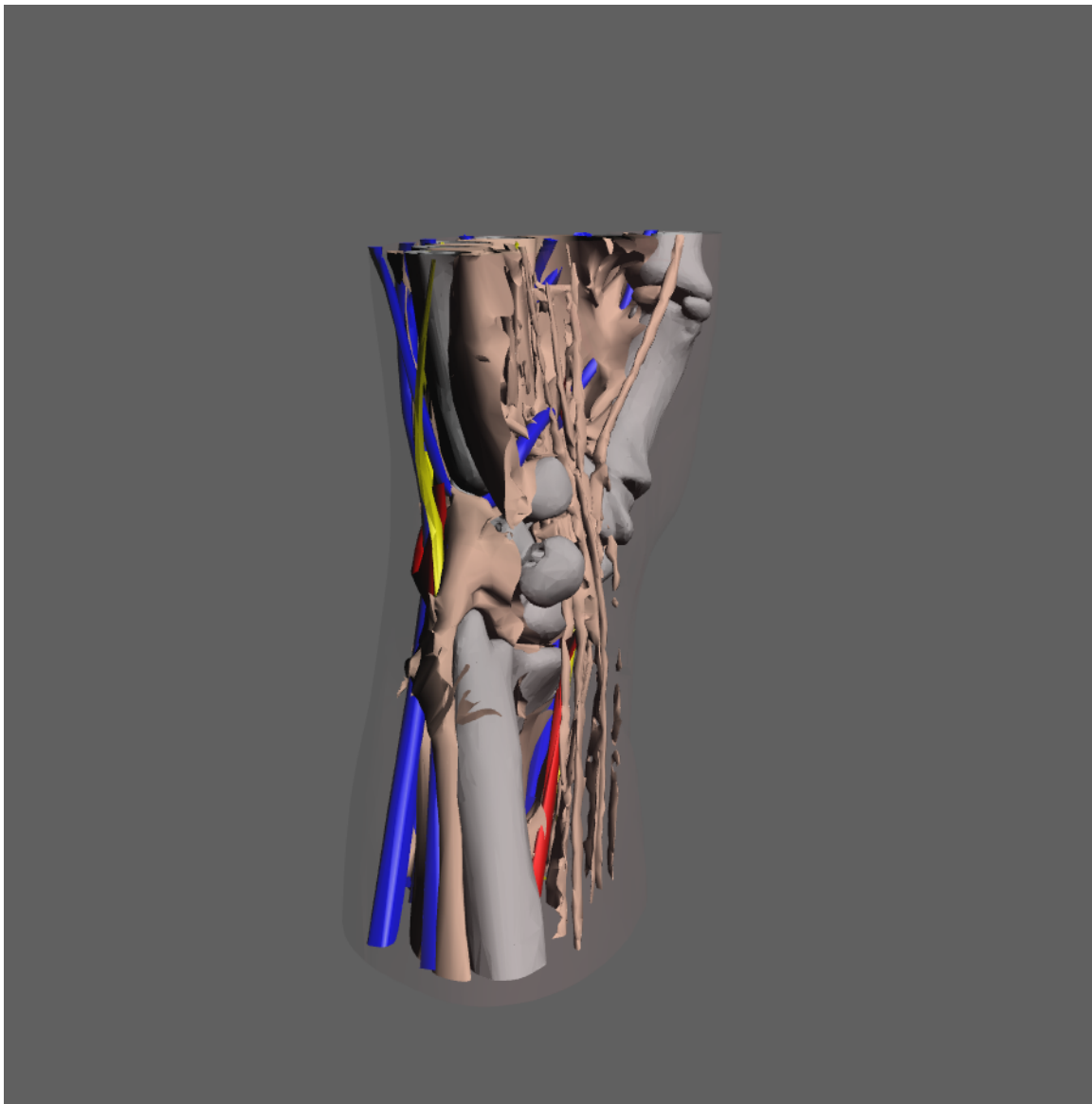
Figure 3 presents those anatomical structures involved in the performance of the procedure of arterial blood sample.

Click on the icon to review the procedure:



**Arterial blood sample**

**FIGURE 3. STRUCTURES IN WRIST**



The structures that can be observed in Figure 3 include:

	<b>ENGLISH</b>	<b>SPANISH</b>	<b>PORTUGUESE</b>	<b>NEDERLANDS</b>
1	Radius	Radio	Rádio	Radius
2	Ulna	Cúbito	Cúbito	Ulna
3	Radial nerve	Nervio radial	Nervo Radial	Radiale zenuw
4	Radial artery	Arteria radial	Artéria Radial	Polsslagader
5	Palmar arterial arch	Arco arterial palmar	Arco arterial palmar	Palmar slagaderboog
6	Palmar venous arch	Arco venoso palmar	Arco venoso palmar	Palmar veneuze boog

## **SECTION 2:**

---

# **Procedures**

---

## CHAPTER 2

# Endotracheal Intubation

---

*Paula Escalada-Hernández, Leticia San Martín-Rodríguez, Tomás Ballesteros-Egüés, Isabel San Martín Erice & Nelia Soto-Ruiz*

# Procedure in English: Endotracheal Intubation

---

## 1. Definition of procedure

Endotracheal intubation consists of passing a tube through the mouth and nose to the trachea. This tube allows oxygen to be administered through a ventilator to help the patient breathe, to suck up secretions and protect the airway from the risk of aspiration.

The specialized clinical guidelines note that endotracheal intubation should be performed exclusively by those healthcare professionals who are adequately trained, and who are experienced in this technique.

## 2. Therapeutic indications and Contraindications

Placement of a tracheal tube is indicated when the patient gaseous exchange is compromised by:

- Glasgow < 8
- Ineffective breathing pattern
- Facial signs of respiratory insufficiency/breathing failure
- Fatigue of the respiratory muscles; general exhaustion
- Low vital lung capacity
- Gas exchange deterioration related to:
  - Hypoxemia: : PaO<sub>2</sub> < 60 mmHg or Sat < 90 % oxygen input
  - Progressive hypercapnia with PaCO<sub>2</sub> > 50 mmHg and pH < 7.25, i.e. acidosis
- Respiratory depression apneas
- Acute respiratory failure with respiratory distress

In addition, it is normal procedure in surgery under general anesthetic.

### **Contraindications:**

Absence of personnel skilled in tracheal intubation.

## 3. Materials

Assemble the following items within safe and easy reach on a tray or trolley, ensuring that all the items are clearly visible (Higgs et al., 2018; Thomas & Moss, 2010; Jimenez, 2000):

- Personal protective equipment (gloves; visor-p.r.n.)
- Monitoring equipment (capnography, pulse oximetry)

- Ambu TM bag, with a reservoir, mask and oxygen connection
- Cuffed endotracheal tubes of appropriate size (Women 7-8; Men 8-9 mm)
- Laryngoscope handle (with batteries) + blades (curved and straight) or Video laryngoscope
- Guedel / nasopharyngeal airways
- Water-soluble lubricant
- 10 ml syringe
- Bougie/stylet
- Suction device and probe
- McGill forceps
- Stethoscope
- Tape or commercial device for fastening
- Cuff pressure gauge
- Emergency airway equipment (i.e. laryngeal masks, cricothyroidotomy kit and fiberoptic intubating laryngoscope)

#### 4. Stages of the procedure

##### Material preparation:

- Prepare the endotracheal tube by checking the cuff, lubricating the tube and inserting the guide
- Prepare the laryngoscope and check the light
- Prepare the medication: Sedative (e.g. Midazolam), Hypnotic (e.g. Propofol), muscle relaxant (e.g. Rocuronium or Anectine) and analgesic (e.g. Fentanyl) – following medical prescription.
- Inform the patient (if he/she is awake)
- Turn on the vacuum system and prepare suction probe
- Remove dentures
- Administer medication according to medical guidelines. The drug regimen is given to produce the following clinical objectives (Dunham, Barraco & Clark, 2002):
  - neuromuscular paralysis
  - sedation, as needed
  - maintain hemodynamic stability
  - prevent intracranial hypertension
  - prevent vomiting

- prevent intra-ocular content extrusion
- Position the Guedel tube and ventilate the patient with mask and ambu bag.

**Intubation:**

The goal is to achieve timely, atraumatic tracheal intubation using the minimum number of attempts. For that, the patient should be (Higgs et al., 2018):

- Positioned optimally: the patient should be put in a 20° head-up position and the bed removed from the wall (Lane et al., 20015). A small pillow can be put under the occiput. Headtilt makes it possible to align the oral, pharyngeal and laryngeal axis so that the intubating passage is in a straight line. The patient adopts the classic “*sniffing the morning air*” position (Prazares, 2002)
- Preoxygenated: The patient should be ventilated with a concentration of 100% oxygen, for a minimum of 15 seconds (Lane et al., 2005)
- Anaesthetized
- Neuromuscularly relaxed

**The procedure shall be made as follows:**

- Watch the airway using the laryngoscope (with non-dominant hand)
- When displayed the epiglottis with the vocal cords, take the endotracheal tube with the dominant hand
- Insert the endotracheal tube. Studies confirm that the approximate correct placement is a depth of 21 cm for women and 23 cm for men (Peart, 2014)
- If necessary, the aspiration of oral secretions will be performed, before or after tube insertion
- Intubation should not take more than 30 seconds. Moreover, in cardiac arrest of less than 10 seconds
- The number of attempts is limited to three. Following a failed intubation attempt, we recommend manoeuvres to improve the laryngoscopic view or ease of intubation in a correctly positioned and adequately paralysed patient. (Higgs et al., 2018)
- Inflate the cuff with 10cc of air

**Immediate care post-intubation:**

- Check correct tube placement:

- Primary confirmation: The chest should be observed for equal expansion, gastric and pulmonary (bases and apex) auscultation, as well as, assessment of saturation and capnography. It is mandatory to use waveform capnography to confirm intubation (AHA, 2015; Higgs et al., 2018)
- Secondary confirmation: thorax radiography to confirm that the tip of the tube is positioned 2 cm above the carina (AHA, 2015; Prazares, 2002)
- Measure the cuff pressure: it should be between 20 and 30 cmH<sub>2</sub>O (Jadot et al., 2018)
- Record the depth of the tube as marked at the front teeth or gums (AHA, 2015)
- Connect the patient to the preprogrammed ventilator and appropriate humidification is necessary, as the endotracheal tube bypasses the upper airway
- Fix the tube with tape or a commercial device

## 5. Potential complications and/or aspects to take into account

When a patient is being intubated by someone without adequate training and experience the risk of complications, such as unrecognised oesophageal intubation and dislodgement, is unacceptably high (Nolan, Ornato, Parr & Soar, 2015).

### Short-term

- Gastric intubation could cause vomiting and a high risk of aspiration (Ono et al., 2018)
- Transient cardiac arrhythmia related to vagal or sympathetic nerve traffic (Ono et al., 2018)
- Syncope in conscious patient (Ono et al., 2018)
- If the endotracheal tube is not inserted enough, there is a risk of injury to the vocal cords and risk of extubation; besides tracheal mucosal injury (Peart, 2014)
- If the endotracheal tube is inserted too far, there is a risk of only aerating a single lung (usually the right one) and a risk of causing massive non-ventilated lung atelectasis (Ono et al., 2018)
- Hypotension caused by medication. Even successful intubation has a high risk of significant haemodynamic instability (up to 25%) (Higgs et al., 2018)
- Hypertension, tachycardia or raised intracranial pressure (Ono et al., 2018)
- Chipping, loosening or loss of teeth (Ono et al., 2018)
- Rupture / drain of the cufftube leads to losing the cuff seal during ventilation (Ono et al., 2018)



- Repeated attempts to pass a tracheal tube are associated with trauma (laryngeal oedema), airway deterioration (bronchospasm), and progression to a CICO (“can’t intubate can’t oxygenate”) situation (Higgs et al., 2018)

**Long-term:**

- Atelectasis
- Airway infection
- Tongue and vocal cords paralysis
- Mandibular swelling
- Dysphagia
- Pressure ulcers in the mucosa around the tube
- Laryngotracheal stenosis
- Polyps/Sinusitis

## References

Alanazi, A. (2015). Intubations and airway management: An overview of Hassles through third millennium. *Journal of Emergencies Trauma and Shock*, 8(2), 99–107. doi: 10.4103/0974-2700.145401

American Heart Association. (2015). *Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care*. Dallas, Texas: AHA

Dunham, C. M., Barraco, R. D., Clark, D. E., et al (2002). Guidelines for emergency tracheal intubation immediately following traumatic injury. An EAST Practice Management Guidelines Workgroup. Youngstown, OH: Eastern Association for the Surgery of Trauma. Retrieved from <https://www.east.org/Content/documents/practicemanagementguidelines/intubation.pdf>

European Resuscitation Council (2015) European Resuscitation Council Guidelines for Resuscitation 2015. Retrieved from <https://ercguidelines.elsevierresource.com/european-resuscitation-council-guidelines-resuscitation-2015-section-3-adult-advanced-life-support/fulltext>

Fuentes Pumarola, C., Bonet Saris, A., Sirvent J. M. & Brugada Motjé, N. (2012). *Manual de enfermería intensiva* (1ª ed). Girona: Documenta Universitaria.

Higgs, A., McGrath, B. A., Goddard, C., Rangasami, J., Suntharalingam, G., Gale, R., & Cook, T. M. (2018). Guidelines for the management of tracheal intubation in critically ill adults. *British Journal of Anaesthesia*, 120(2), 323-352. doi:10.1016/j.bja.2017.10.021

Jadot, L., Huyghens, L., De Jaeger, A., Bourgeois, M., Biarent, D., Higuete, A., de Decker, K., Vander Laenen, M., Oosterlynck, B., Ferdinande, P., ... Damas, P. (2018). Impact of a VAP bundle in Belgian intensive care units. *Annals of Intensive Care*, 8(1), 65. doi:10.1186/s13613-018-0412-8

Jimenez, R. (2000) *How to Decrease the Incidence of Mainstream Intubation*. Northbrook, Ill: American College of Chest Physicians.

Lane, S. , Saunders, D. , Schofield, A. , Padmanabhan, R. , Hildreth, A. & Laws, D. (2005), A prospective, randomised controlled trial comparing the efficacy of pre-oxygenation in the 20° head-up vs supine position\*. *Anaesthesia*, 60: 1064-1067. doi:10.1111/j.1365-2044.2005.04374.x

Logston Boggs, R., & Wooldridge-King, M. (1995). *Terapia intensiva. Procedimientos de la American Association of Critical-Care Nurses* (3ª ed). Buenos Aires: Panamericana.

Nolan, J.P., Ornato, J.P., Parr, M.J.A., & Soar, G.D. (2015). Resuscitation highlights in 2014. *Resuscitation*, 89, A1-6. doi: 10.1016

Ono, Y., Kakamu, T., Kikuchi, H., Mori, Y., Watanabe, Y., & Shinohara, K. (2018). Expert-performed endotracheal intubation-related complications in trauma patients: incidence, possible risk factors, and outcomes in the prehospital setting and emergency department. *Emergency medicine international*, 2018, 5649476. doi:10.1155/2018/5649476

Peart, O. 2014. Endotracheal Intubation. *Radiologic Technology*, 85(5), 578-579.

Prazeres, G. de A. (2002). Orotracheal Intubation. Retrieved from [www.medstudents.com.br/proced/proced5/intubat.htm](http://www.medstudents.com.br/proced/proced5/intubat.htm)

Thomas, E.B. & Moss, S. (2010) Tracheal intubation. *Anaesthesia and intensive care medicine*, 11 (10): 410-412.

# Procedure in Spanish: Intubación Endotraqueal

---

## 1. Definición del procedimiento

La intubación endotraqueal es la introducción de un tubo a través de la boca o nariz hacia la tráquea. Este tubo permite administrar oxígeno a través de un ventilador con la finalidad de favorecer el intercambio gaseoso, aspirar secreciones y proteger la vía aérea del riesgo de broncoaspiración.

Las guías clínicas especializadas advierten que la intubación traqueal sólo debe ser realizada por un profesional sanitario que esté adecuadamente entrenado y que tenga experiencia en esta técnica.

## 2. Indicaciones terapéuticas y contraindicaciones

La colocación de un tubo traqueal está indicada en múltiples situaciones graves que comprometen el adecuado intercambio gaseoso del paciente, como son:

- Glasgow < 8
- Patrón respiratorio inefectivo
- Signos faciales de insuficiencia respiratoria
- Fatiga de los músculos respiratorios
- Capacidad pulmonar vital baja
- Deterioro del intercambio gaseoso relacionado con:
  - Hipoxemia: PaO<sub>2</sub> < 60 mmHg y SatO<sub>2</sub> < 90 % con aporte de oxígeno
  - Hipercapnia progresiva con PaCO<sub>2</sub> > 50 mmHg y pH < 7,25, es decir acidosis respiratoria
- Depresión respiratoria con apneas
- Insuficiencia respiratoria aguda con agotamiento respiratorio

Además, es un procedimiento habitual en el proceso anestésico del paciente quirúrgico.

### **Contraindicaciones:**

Ausencia de personal especializado en intubación traqueal.

## 3. Material

El material requerido para el procedimiento es:

- Equipo de protección personal (guantes, pantalla facial...)

- Equipo de monitorización (capnografía, pulsioximetría)
- Ambú con reservorio, mascarilla y conexión de oxígeno
- Tubo endotraqueal del número apropiado (mujeres 7-8; hombres 8-9)
- Mango de laringoscopio (con baterías) + palas (curva y recta), o vídeo laringoscopio
- Cánula de Guedel
- Lubricante soluble en agua
- Jeringa de 10 ml
- Fiador
- Dispositivo de aspiración y sonda
- Pinza de Magill
- Fonendoscopio
- Cinta o dispositivo comercial para fijación
- Manómetro de presión
- Equipos de emergencia para la vía aérea (por ejemplo: máscaras laríngeas, kit de cricotiroidotomía y laringoscopio de intubación de fibra óptica)

#### 4. Pasos del procedimiento

##### Preparación del material:

- Prepare el tubo endotraqueal comprobando el balón, lubricando el tubo e introduciendo la guía dentro del mismo
- Prepare el laringoscopio (unir pala y mango) y comprobar la luz
- Prepare el medicamento: sedante (por ejemplo, Midazolam), hipnótico (por ejemplo, Propofol), relajante muscular (por ejemplo, Rocuronio o Anectina) y analgésico (por ejemplo, Fentanilo), siguiendo la prescripción médica
- Informe al paciente (si está despierto)
- Encienda el sistema de aspiración y deje preparada la sonda de aspiración
- Retire las prótesis dentales
- Administre la medicación según protocolo del centro. La medicación utilizada en este procedimiento tiene los siguientes objetivos (Dunham, Barraco & Clark, 2002):
  - Parálisis neuromuscular
  - Sedación (según necesidades)
  - Mantener la estabilidad hemodinámica
  - Prevenir la hipertensión intracraneal
  - Prevenir vómitos

- Prevenir la extrusión del líquido intraocular
- Coloque el tubo de Guedel (imagen X) y ventilar al paciente con mascarilla y ambú

### **Intubación:**

El objetivo es realizar una intubación en el intervalo de tiempo adecuado utilizando el mínimo número de intentos. Para ello, el paciente debe estar (Higgs et al., 2018):

- Posicionado de forma óptima: el paciente debe colocarse con la cabeza ligeramente extendida y la mandíbula proyectada hacia delante, y la cama debe retirarse de la pared (Lane et al., 20015). Se puede poner una almohada pequeña debajo del occipucio. Inclinar la cabeza hace posible alinear el eje oral, faríngeo y laríngeo de modo que el paso para la intubación esté en línea recta. El paciente adopta la posición clásica de olfateo (Prazares, 2002)
- Preoxigenado: El paciente debe ser ventilado con una concentración de oxígeno al 100%, durante un mínimo de 15 segundos (Lane et al., 2005)
- Anestesiado
- Relajado muscularmente

### **El procedimiento se realiza como sigue:**

- Observe la vía aérea utilizando el laringoscopio (con la mano no dominante)
- Cuando se visualice la epiglotis con las cuerdas vocales, pida (o coja) con la mano dominante el tubo endotraqueal
- Inserte el tubo endotraqueal. Los estudios confirman que la colocación correcta aproximada es una profundidad de 21 cm para las mujeres y 23 cm para los hombres (Peart, 2014)
- En el caso que fuera necesario, proceda a la aspiración de secreciones bucales antes o después de la introducción del tubo
- La intubación no debe durar más de 30 segundos y en paradas cardiacas, menos de 10 segundos
- No se deben realizar más de 3 intentos de intubación de esta manera. Después de un intento de intubación fallido, se recomienda realizar maniobras para mejorar la visión laringoscópica, la posición del paciente y la sedación del mismo (Higgs et al., 2018)
- Infle el balón del tubo con ayuda de la jeringa (10 cc de aire)

### **Cuidados inmediatos post-intubación:**

- Compruebe la correcta colocación del tubo:
  - Confirmación primaria: en el tórax debe observarse una expansión simétrica, auscultación gástrica y pulmonar (bases y vértices), así como valoración de saturación y capnografía. Las guías internacionales destacan la capnografía como el método definitivo (AHA, 2015; Higgs et al., 2018)
  - Confirmación secundaria: Radiografía de tórax para confirmar que la punta del tubo está colocada 2 cm por encima de la carina (AHA, 2015; Prazeres, 2002)
- Mida la presión del manguito: debe estar entre 20 y 30 cmH<sub>2</sub>O (Jadot et al., 2018)
- Registre la profundidad del tubo tomando como referencia los incisivos o encías frontales (AHA, 2015)
- Conecte el paciente al ventilador preprogramado. Será necesaria una humidificación adecuada, ya que el tubo endotraqueal pasa por alto la vía aérea superior
- Fije el tubo con esparadrapo o un sistema para tal fin

## **5. Complicaciones potenciales y/o aspectos a considerar**

Un paciente intubado por alguien sin la capacitación adecuada experimenta un riesgo de complicaciones (como el desplazamiento esofágico no reconocido) inaceptablemente alto (Nolan, Ornato, Parr & Soar, 2015).

Las posibles complicaciones del procedimiento son:

### **A corto plazo:**

- Introducción del tubo en la vía gástrica, lo que podría provocar vómito y alto riesgo de broncoaspiración
- Arritmia cardíaca transitoria relacionada con el tráfico vagal o nervioso simpático (Ono et al., 2018)
- Síncope en el paciente consciente
- Si el tubo endotraqueal está poco introducido existe riesgo de lesión en las cuerdas vocales y mayor riesgo de extubación, además de lesión en la mucosa traqueal (Peart, 2014)

- Si el tubo endotraqueal está introducido en exceso existe el riesgo de estar ventilando un único pulmón (generalmente el derecho), lo que puede producir atelectasia masiva del pulmón no ventilado (Ono et al., 2018)
- Hipotensión arterial provocada por la medicación. Incluso cuando la intubación es exitosa hay un alto riesgo de significativa inestabilidad hemodinámica (hasta un 25%) (Higgs et al., 2018)
- Hipertensión, taquicardia o presión intracraneal elevada (Ono et al., 2018)
- Astillado, aflojamiento o pérdida de piezas dentales
- Rotura/fuga del balón del tubo provocando pérdida del sello durante la ventilación (Ono et al., 2018)
- Los intentos repetidos de pasar un tubo traqueal se asocian con traumatismo (edema laríngeo), deterioro de las vías respiratorias (broncoespasmo) y progresión a una situación de CICO ("no se puede intubar, no se puede oxigenar") (Higgs et al., 2018)

**A largo plazo:**

- Atelectasia
- Neumonía asociada al ventilador
- Parálisis de lengua y cuerdas vocales
- Inflamación mandibular
- Disfagia
- Úlceras por presión en la mucosa alrededor del tubo
- Estenosis laringotraqueal
- Pólipos/Sinusitis



## Referencias

Alanazi, A. (2015). Intubations and airway management: An overview of Hassles through third millennium. *Journal of Emergencies Trauma and Shock*, 8(2), 99–107. doi: 10.4103/0974-2700.145401

American Heart Association. (2015). *Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care*. Dallas, Texas: AHA

Dunham, C. M., Barraco, R. D., Clark, D. E., et al (2002). Guidelines for emergency tracheal intubation immediately following traumatic injury. An EAST Practice Management Guidelines Workgroup. Youngstown, OH: Eastern Association for the Surgery of Trauma. Retrieved from <https://www.east.org/Content/documents/practicemanagementguidelines/intubation.pdf>

European Resuscitation Council (2015) European Resuscitation Council Guidelines for Resuscitation 2015. Retrieved from <https://ercguidelines.elsevierresource.com/european-resuscitation-council-guidelines-resuscitation-2015-section-3-adult-advanced-life-support/fulltext>

Fuentes Pumarola, C., Bonet Saris, A., Sirvent J. M. & Brugada Motjé, N. (2012). *Manual de enfermería intensiva* (1ª ed). Girona: Documenta Universitaria.

Higgs, A., McGrath, B. A., Goddard, C., Rangasami, J., Suntharalingam, G., Gale, R., & Cook, T. M. (2018). Guidelines for the management of tracheal intubation in critically ill adults. *British Journal of Anaesthesia*, 120(2), 323-352. doi:10.1016/j.bja.2017.10.021

Jadot, L., Huyghens, L., De Jaeger, A., Bourgeois, M., Biarent, D., Higuete, A., de Decker, K., Vander Laenen, M., Oosterlynck, B., Ferdinande, P., ... Damas, P. (2018). Impact of a VAP bundle in Belgian intensive care units. *Annals of Intensive Care*, 8(1), 65. doi:10.1186/s13613-018-0412-8

Jimenez, R. (2000) *How to Decrease the Incidence of Mainstream Intubation*. Northbrook, Ill: American College of Chest Physicians.

Lane, S. , Saunders, D. , Schofield, A. , Padmanabhan, R. , Hildreth, A. & Laws, D. (2005), A prospective, randomised controlled trial comparing the efficacy of pre-oxygenation in the 20° head-up vs supine position\*. *Anaesthesia*, 60: 1064-1067. doi:10.1111/j.1365-2044.2005.04374.x

Logston Boggs, R., & Wooldridge-King, M. (1995). *Terapia intensiva. Procedimientos de la American Association of Critical-Care Nurses* (3ª ed). Buenos Aires: Panamericana.

Nolan, J.P., Ornato, J.P., Parr, M.J.A., & Soar, G.D. (2015). Resuscitation highlights in 2014. *Resuscitation*, 89, A1-6. doi: 10.1016

Ono, Y., Kakamu, T., Kikuchi, H., Mori, Y., Watanabe, Y., & Shinohara, K. (2018). Expert-performed endotracheal intubation-related complications in trauma patients: incidence, possible risk factors, and outcomes in the prehospital setting and emergency department. *Emergency medicine international*, 2018, 5649476. doi:10.1155/2018/5649476

Peart, O. 2014. Endotracheal Intubation. *Radiologic Technology*, 85(5), 578-579.

Prazeres, G. de A. (2002). Orotracheal Intubation. Retrieved from [www.medstudents.com.br/proced/proced5/intubat.htm](http://www.medstudents.com.br/proced/proced5/intubat.htm)

Thomas, E.B. & Moss, S. (2010) Tracheal intubation. *Anaesthesia and intensive care medicine*, 11 (10): 410-412.

# Procedure in Portuguese: Entubação Endotraqueal

---

## 1. Definição de processo

A entubação endotraqueal consiste na passagem de um tubo através da boca e do nariz para a traqueia. O tubo permite a administração de oxigénio através de um ventilador para ajudar o doente a respirar, para aspirar secreções e proteger as vias respiratórias do risco de aspiração.

As guidelines especializadas referem que a entubação endotraqueal deve ser realizada exclusivamente por profissionais de saúde com formação adequada e experiência nesta técnica.

## 2. Indicações terapêuticas e contraindicações

A colocação de um tubo traqueal é indicada quando as trocas gasosas são comprometidas por:

- Escala de Coma de Glasgow <8
- Padrão respiratório ineficaz
- Sinais faciais de insuficiência respiratória
- Fadiga dos músculos respiratórios; exaustão geral
- Baixa capacidade pulmonar vital
- Deterioração das trocas gasosas relacionada com:
  - Hipoxemia: PaO<sub>2</sub> <60 mmHg ou Sat <90 % de entrada de oxigénio
  - Hipercapnia progressiva com PaCO<sub>2</sub> > 50 mmHg e pH <7,25, ou seja, acidose
- Apneia e depressão respiratória
- Insuficiência respiratória aguda com problemas respiratórios

Além disso, é um procedimento normal em cirurgia sob anestesia geral.

### **Contraindicações:**

Ausência de pessoal qualificado em entubação traqueal.

## 3. Materiais

Reúna os seguintes itens ao seu alcance de forma segura e fácil numa bandeja ou carrinho, garantindo que todos os itens estão claramente visíveis (Higgs et al., 2018; Thomas & Moss, 2010, Jimenez, 2000):

- Equipamento de proteção individual (luvas, viseira/p.r.n).
- Equipamento de monitorização (capnografia, oximetria de pulso)
- Ressuscitador manual tipo Ambu, com reservatório, máscara e conexão de oxigénio

- Tubos endotraqueais com cuff de tamanho adequado (Mulheres 7-8; Homens 8-9 mm)
- Laringoscópio (com pilhas) + lâminas (curvas e retas) ou laringoscópio com vídeo
- Tubo de guedel/nasofaríngeo
- Lubrificante solúvel em água
- Seringa de 10 ml
- Cateter bougie/estilete
- Sistema de aspiração e sonda
- Pinça de Maguil
- Estetoscópio
- Fita de nastro ou outro dispositivo comercial para fixação
- Medidor de pressão do cuff
- Equipamento de vias respiratórias de emergência (por exemplo, máscaras laríngeas, kit de cricotiroidotomia e laringoscópio de fibra ótica)

#### 4. Fases do procedimento

##### Preparação do material:

- Prepare o tubo endotraqueal, verificando o cuff, lubrificando o tubo e inserindo o guia
- Prepare o laringoscópio e verifique a luz
- Prepare a medicação: sedativa (ex. Midazolam), hipnótica (ex. Propofol), relaxante muscular (p. ex. Rocuronium ou Anectine) e analgésica (ex. Fentanil) - segundo prescrição médica
- Informe o/a doente (se ele/ela estiver acordado/a)
- Ligue o sistema de vácuo e prepare a sonda de aspiração
- Remova quaisquer próteses dentárias
- Administre medicamentos de acordo com as diretrizes médicas. O regime medicamentoso pretende produzir os seguintes objetivos clínicos (Dunham, Barraco & Clark, 2002):
  - paralisia neuromuscular
  - sedação, conforme necessário
  - manter a estabilidade hemodinâmica
  - prevenir hipertensão intracraniana
  - prevenção de vômitos
  - evitar a extrusão de conteúdo intraocular
- Posicione o tubo de Guedel e ventile o doente com máscara e ressuscitador manual

### **Entubação:**

O objetivo é realizar uma entubação traqueal oportuna e não traumática, usando a quantidade mínima de tentativas. Para tal, o doente deve estar (Higgs et al., 2018):

- Posicionado de forma ideal: o doente deve ser colocado numa posição de 20° com a cabeça para cima e a cama afastada da parede (Lane et al., 20015). Pode colocar-se uma pequena almofada sob o occipital. A inclinação da cabeça possibilita o alinhamento do eixo oral, faríngeo e laríngeo para que a passagem da entubação esteja em linha reta. O doente adota a posição clássica de «cheirar o ar da manhã» (Prazares, 2002)
- Pré-oxigenação: O paciente deve ser ventilado com uma concentração de 100% de oxigénio durante um mínimo de 15 segundos (Lane et al., 2005)
- Anestesiado
- Relaxado neuromuscularmente

### **O procedimento deve ser feito do seguinte modo:**

- Observe a via aérea com o laringoscópio (com a mão esquerda)
- Quando visualizada a epiglote com as cordas vocais, pegue o tubo endotraqueal com a mão direita
- Insira o tubo endotraqueal. Estudos confirmam que a colocação correta aproximada é de uma profundidade de 21 cm para mulheres e 23 cm para os homens (Peart, 2014)
- Se necessário, realiza-se a aspiração de secreções, antes ou depois da inserção do tubo.
- A entubação não deve demorar mais de 30 segundos. Em caso de paragem cardíaca, menos de 10 segundos
- O número limite de tentativas é três. Após uma tentativa mal sucedida de entubação, recomendamos manobras para melhorar a visualização por laringoscopia ou facilitar a entubação num paciente corretamente posicionado e adequadamente relaxado (Higgs et al., 2018)
- Inflar o cuff com 10cc de ar

### **Cuidados imediatos pós-entubação:**

- Verifique o correto posicionamento do tubo:
  - Confirmação primária: o tórax deve ser observado em termos de expansão regular, auscultação pulmonar e gástrica (bases e ápices), bem como avaliação da saturação de oxigénio e capnografia. É obrigatório o uso de capnografia para confirmar a entubação (AHA, 2015; Higgs et al., 2018)

- Confirmação secundária: radiografia de tórax para confirmar se a ponta do tubo está posicionada 2 cm acima da carina (AHA, 2015; Prazares, 2002)
- Meça a pressão do cuff: deve estar entre os 20 e 30 cm H<sub>2</sub>O (Jadot et al., 2018)
- Registe a profundidade do tubo conforme marcado nos dentes incisivos ou nas gengivas (AHA, 2015)
- Ligue o doente ao ventilador pré-programado, e é necessária a humidificação apropriada, uma vez que o tubo endotraqueal não passa pela via respiratória superior.
- Fixe o tubo com fita de nastro ou outro dispositivo comercial

## 5. Possíveis complicações e/ou aspetos a ter em conta

Quando um doente está a ser entubado por alguém sem experiência e formação adequada, o risco de complicações, tais como entubação esofágica não reconhecida e deslocamento, é inaceitavelmente alto (Nolan, Ornato, Parr & Soar, 2015).

### Curto prazo:

- A entubação gástrica pode causar vómitos e um alto risco de aspiração (Ono et al., 2018)
- Arritmia cardíaca transitória relacionada com a estimulação do simpático ou nervo vago (Ono et al., 2018)
- Síncope em doente consciente (Ono et al., 2018)
- Se o tubo endotraqueal não está suficientemente inserido, há um risco de danos para as cordas vocais e risco de extubação; além de lesão da mucosa traqueal (Peart, 2014)
- Se o tubo endotraqueal está demasiado inserido para dentro, há o risco de apenas ventilar um único pulmão (geralmente o direito) e um risco de causar atelectasia grave do pulmão não ventilado (Ono et al., 2018)
- Hipotensão causada pela medicação. Até a entubação bem-sucedida tem um alto risco de instabilidade hemodinâmica significativa (até 25%) (Higgs et al., 2018)
- Hipertensão arterial, taquicardia ou pressão intracraniana elevada (Ono et al., 2018)
- Quebra ou perda de dentes (Ono et al., 2018)
- A drenagem/rutura do cuff causa a perda da selagem durante a ventilação (Ono et al., 2018)
- Várias tentativas de passar um tubo traqueal estão associadas a trauma (edema laríngeo), deterioração das vias respiratórias (broncospasmo) e progressão para um cenário CICO (“can’t intubate can’t oxygenate”) (Higgs et al., 20)

**Longo prazo:**

- Atelectasia
- Infecção das vias respiratórias
- Paralisia da língua e das cordas vocais
- Edema mandibular
- Disfagia
- Úlceras
- Estenose
- Pólipos

## Referências Bibliográficas

Alanazi, A. (2015). Intubations and airway management: An overview of Hassles through third millennium. *Journal of Emergencies Trauma and Shock*, 8(2), 99–107. doi: 10.4103/0974-2700.145401

American Heart Association. (2015). *Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care*. Dallas, Texas: AHA

Dunham, C. M., Barraco, R. D., Clark, D. E., et al (2002). Guidelines for emergency tracheal intubation immediately following traumatic injury. An EAST Practice Management Guidelines Workgroup. Youngstown, OH: Eastern Association for the Surgery of Trauma. Retrieved from <https://www.east.org/Content/documents/practicemanagementguidelines/intubation.pdf>

European Resuscitation Council (2015) European Resuscitation Council Guidelines for Resuscitation 2015. Retrieved from <https://ercguidelines.elsevierresource.com/european-resuscitation-council-guidelines-resuscitation-2015-section-3-adult-advanced-life-support/fulltext>

Fuentes Pumarola, C., Bonet Saris, A., Sirvent J. M. & Brugada Motjé, N. (2012). *Manual de enfermería intensiva* (1ª ed). Girona: Documenta Universitaria.

Higgs, A., McGrath, B. A., Goddard, C., Rangasami, J., Suntharalingam, G., Gale, R., & Cook, T. M. (2018). Guidelines for the management of tracheal intubation in critically ill adults. *British Journal of Anaesthesia*, 120(2), 323-352. doi:10.1016/j.bja.2017.10.021

Jadot, L., Huyghens, L., De Jaeger, A., Bourgeois, M., Biarent, D., Higuete, A., de Decker, K., Vander Laenen, M., Oosterlynck, B., Ferdinande, P., ... Damas, P. (2018). Impact of a VAP bundle in Belgian intensive care units. *Annals of Intensive Care*, 8(1), 65. doi:10.1186/s13613-018-0412-8

Jimenez, R. (2000) *How to Decrease the Incidence of Mainstream Intubation*. Northbrook, Ill: American College of Chest Physicians.

Lane, S. , Saunders, D. , Schofield, A. , Padmanabhan, R. , Hildreth, A. & Laws, D. (2005), A prospective, randomised controlled trial comparing the efficacy of pre-oxygenation in the 20° head-up vs supine position\*. *Anaesthesia*, 60: 1064-1067. doi:10.1111/j.1365-2044.2005.04374.x

Logston Boggs, R., & Wooldridge-King, M. (1995). *Terapia intensiva. Procedimientos de la American Association of Critical-Care Nurses* (3ª ed). Buenos Aires: Panamericana.



Nolan, J.P., Ornato, J.P., Parr, M.J.A., & Soar, G.D. (2015). Resuscitation highlights in 2014. *Resuscitation*, 89, A1-6. doi: 10.1016

Ono, Y., Kakamu, T., Kikuchi, H., Mori, Y., Watanabe, Y., & Shinohara, K. (2018). Expert-performed endotracheal intubation-related complications in trauma patients: incidence, possible risk factors, and outcomes in the prehospital setting and emergency department. *Emergency medicine international*, 2018, 5649476. doi:10.1155/2018/5649476

Peart, O. 2014. Endotracheal Intubation. *Radiologic Technology*, 85(5), 578-579.

Prazeres, G. de A. (2002). Orotracheal Intubation. Retrieved from [www.medstudents.com.br/proced/proced5/intubat.htm](http://www.medstudents.com.br/proced/proced5/intubat.htm)

Thomas, E.B. & Moss, S. (2010) Tracheal intubation. *Anaesthesia and intensive care medicine*, 11 (10): 410-412.

# Procedure in Nederlands: Endotracheale Intubatie

---

## 1. Definitie van de procedure

Bij een endotracheale intubatie wordt een tube via de mond en neus tot in de trachea geplaatst. Deze tube zorgt ervoor dat zuurstof kan worden toegediend door een beademingstoestel om de zorgvrager te helpen ademen, secreties te aspireren en de luchtweg te beveiligen tegen aspiratie.

Gespecialiseerde klinische guidelines vermelden dat endotracheale intubatie zou moeten worden uitgevoerd door zorgverleners die hiertoe zijn opgeleid en ervaring hebben met het uitvoeren van deze techniek.

## 2. Therapeutische indicaties

Het plaatsen van een tracheale tube is geïndiceerd wanneer de gasuitwisseling van de zorgvrager is gecompromitteerd door:

- Glasgow < 8
- Ineffectief ademhalingspatroon
- Tekenen van respiratoire insufficiëntie of falen van de ademhaling in het aangezicht
- Vermoeidheid van de ademhalingsspieren; algemene uitputting
- Lage longcapaciteit
- Verslechteren van de gasuitwisseling gerelateerd aan:
  - Hypoxemie: : PaO<sub>2</sub> < 60 mmHg of SaO<sub>2</sub> < 90 %
  - Progressieve hypercapnie met PaCO<sub>2</sub> > 50 mmHg en pH < 7,25, i.e. acidose
- Respiratoire depressie apnoe
- Acuut respiratoir falen met respiratoire distress

Aanvullend, is dit een normale procedure bij chirurgie onder algemene anesthesie.

### Contraindicaties:

Afwezigheid van geschoold personeel dat ervaring heeft met tracheale intubatie.

## 3. Materiaal

- Persoonlijk beschermingsmateriaal (handschoenen, masker...)
- Monitoring (capnografie en pulsoxymeter)
- Beademingsballon met reservoir, masker en zuurstofaansluiting

- Guedel tube / nasofaryngeale tube
- De aangepaste maat van endotracheale tube met cuff (vrouw 7-8; man 8-9)
- Glijmiddel op waterbasis
- Laryngoscoop bestaande uit handvat, gebogen en recht blad
- Obturator
- 10 ml spuit
- Aspiratietoestel en aspiratiekatheter
- McGill tang
- Stethoscoop
- Kleefpleister of commercieel systeem voor bevestiging van de endotracheale tube
- Cuffdrukmeter
- Spoedset voor intubatie (larynx masker, set voor cricothyroidotomie en materiaal voor fiberoptische intubatie)

## 4. Stappenplan

### Vorbereiding material:

- Vorbereiding van de endotracheale tube waarbij de cuff wordt getest, het glijmiddel wordt aangebracht en de obturator wordt ingebracht
- Bereid de laryngoscoop voor en controleer het licht
- Bereid de medicatie voor: Sedativum (Midazolam), Hypnoticum (Propofol), Curare (Rocuronium or Anectine) en Analgeticum (Fentanyl) – de arts bepaalt welke medicatie geschikt is in de specifieke situatie
- Informeer de zorgvrager (is de zorgvrager wakker?)
- Zet het aspiratietoestel aan en bereid de aspiratiekatheter voor
- Verwijder het kunstgebit
- Dien de medicatie toe volgens medisch voorschrift. De geneesmiddel die toegediend worden hebben volgende medische doelen (Dunham, Barraco & Clark, 2002):
  - Neuromusculaire paralyse
  - Sedatie, indien nodig
  - Handhaven van de hemodynamische stabiliteit
  - Preventie van intracranieële hypertensie
  - Voorkomen van braken
  - Voorkomen van extrusie van intra-oculaire structuren
- Breng de Guedel tube in en ventileer de zorgvrager met masker en beademingsballon

## **Intubatie:**

Het doel is om tijdig , een atraumatische tracheale intubatie uit te voeren, met een minimaal aantal pogingen. Daarom moet de zorgvrager (Higgs et al., 2018):

- Optimaal gepositioneerd zijn, de zorgvrager moet gepositioneerd zijn met het hoofdeinde in een positie van 20° en het bed moet verwijderd zijn van de muur (Lane et al., 20015). Er kan een klein kussen onder het achterhoofd worden gelegd. Headtilt kan ervoor zorgen dat de orale, pharyngeale en laryngeale as in een rechte lijn lopen. De zorgvrager wordt in een “sniffing the morning air” positie gelegd (Prazares, 2002)
- Gepreoxygeneerd zijn met en zuurstofconcentratie van 100% gedurende minstens 15 seconden
- Onder anesthesie gebracht zijn
- Neuromusculair gerelaxeerd zijn

## **De procedure verloopt als volgt:**

- Bekijk de luchtweg door middel van de laryngoscoop (met de niet-dominante hand)
- Wanneer de epiglottis en de stembanden zichtbaar zijn, neem de endotracheale tube met de rechter hand
- Breng de endotracheale tube in. Studies bevestigen dat bij een correcte plaatsing de diepte ongeveer 21 cm bedraagt bij vrouwen en 23 cm bij mannen (Peart, 2014)
- Indien nodig, worden orale secreties geaspireerd voor of na de intubatie
- Intubatie mag niet langer duren dan 30 seconden. Bij een hartstilstand mag dit maximaal 10 seconden duren
- Het maximaal aantal pogingen is beperkt tot drie. Na een mislukte intubatiepoging, raden we aan om een handeling te stellen die de zichtbaarheid door middel van laryngoscopie te optimaliseert of de intubatie vergemakkelijkt door de zorgvrager goed te positioneren of voldoende spierverslappers toe te dienen. (Higgs et al., 2018)
- Blaas de cuff op met 10 ml lucht

## **Onmiddellijke post-intubatie zorg:**

- Controleer de correcte plaatsing van de tube:
  - Eerste bevestiging: auscultatie van de maag en de bovenste en onderste longvelden en beoordeling van de saturatie en capnografie. Het is verplicht om de golfvormcapnografie te gebruiken om de intubatie te bevestigen (AHA, 2015; Higgs et al., 2018)

- Secondaire bevestiging: RX thorax om te bevestigen dat de tip van de tube zich 2 cm boven de carina bevindt (AHA, 2015; Prazares, 2002)
- Noteer de diepte van de endotracheale tube. Deze lees je af op de tube ter hoogte van de voortanden of het tandvlees (AHA, 2015)
- Connecteer de zorgvrager aan het geprogrammeerd beademingstoestel, zorg voor aangepaste bevochtiging aangezien de endotracheale tube de bovenste luchtweg bypass
- Fixeer de tube met kleefpleister of een commercieel systeem

## 5. Potentiële complicaties en/of aandachtspunten

Wanneer een patiënt geïntubeerd wordt door iemand zonder degelijke training en ervaring bestaat er een onredelijk hoog risico op complicaties zoals oesofagale intubatie of dislocatie van de tube (Nolan, Ornato, Parr & Soar, 2015).

### Korte termijn:

- Maagintubatie kan leiden tot braken en hoog risico op aspiratie (Ono et al., 2018).
- Plotse hartritmestoornis, gerelateerd aan de stimulatie van de nervus vagus of nervus sympathicus.
- Syncope bij een bewusteloze zorgvrager (Ono et al., 2018).
- Wanneer een endotracheale tube niet diep genoeg wordt ingebracht, bestaat er een risico op beschadiging van de stembanden, accidentele extubatie of ontstaan van een mucosaletsel (Peart, 2014).
- Wanneer een endotracheale tube te diep wordt ingebracht, bestaat het risico op single lung ventilatie (meestal de rechter long) en kan een grote atelectase optreden ten gevolge van het niet ventileren van een long (Ono et al., 2018).
- Hypotensie ten gevolge van medicatiegebruik. Zelfs bij een succesvolle intubatie bestaat een groot risico op significante hemodynamische instabiliteit (tot 25%) (Higgs et al., 2018).
- Breken, loswrikken of verliezen van tanden (Ono et al., 2018).
- Scheuren van de cuffleiding leidt tot een luchtlek ter hoogte van de cuff en onvolledige afsluiting van de trachea tijdens de ventilatie (Ono et al., 2018).
- Herhaalde pogingen om de tracheale tube te plaatsen kan leiden tot trauma, deterioratie van de luchtweg, en evolutie naar een toestand van “can’t intubate can’t oxygenate” (Higgs et al., 2018).

**Langetermijn:**

- Atelectase
- Luchtweginfectie
- Paralyse van de tong en de stembanden
- Mandibulaire zwelling
- Dysphagie
- Ulcera
- Stenose
- Poliepen

## Referentias

Alanazi, A. (2015). Intubations and airway management: An overview of Hassles through third millennium. *Journal of Emergencies Trauma and Shock*, 8(2), 99–107. doi: 10.4103/0974-2700.145401

American Heart Association. (2015). *Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care*. Dallas, Texas: AHA

Dunham, C. M., Barraco, R. D., Clark, D. E., et al (2002). Guidelines for emergency tracheal intubation immediately following traumatic injury. An EAST Practice Management Guidelines Workgroup. Youngstown, OH: Eastern Association for the Surgery of Trauma. Retrieved from <https://www.east.org/Content/documents/practicemanagementguidelines/intubation.pdf>

European Resuscitation Council (2015) European Resuscitation Council Guidelines for Resuscitation 2015. Retrieved from <https://ercguidelines.elsevierresource.com/european-resuscitation-council-guidelines-resuscitation-2015-section-3-adult-advanced-life-support/fulltext>

Fuentes Pumarola, C., Bonet Saris, A., Sirvent J. M. & Brugada Motjé, N. (2012). *Manual de enfermería intensiva* (1ª ed). Girona: Documenta Universitaria.

Higgs, A., McGrath, B. A., Goddard, C., Rangasami, J., Suntharalingam, G., Gale, R., & Cook, T. M. (2018). Guidelines for the management of tracheal intubation in critically ill adults. *British Journal of Anaesthesia*, 120(2), 323-352. doi:10.1016/j.bja.2017.10.021

Jadot, L., Huyghens, L., De Jaeger, A., Bourgeois, M., Biarent, D., Higuete, A., de Decker, K., Vander Laenen, M., Oosterlynck, B., Ferdinande, P., ... Damas, P. (2018). Impact of a VAP bundle in Belgian intensive care units. *Annals of Intensive Care*, 8(1), 65. doi:10.1186/s13613-018-0412-8

Jimenez, R. (2000) *How to Decrease the Incidence of Mainstream Intubation*. Northbrook, Ill: American College of Chest Physicians.

Lane, S. , Saunders, D. , Schofield, A. , Padmanabhan, R. , Hildreth, A. & Laws, D. (2005), A prospective, randomised controlled trial comparing the efficacy of pre-oxygenation in the 20° head-up vs supine position\*. *Anaesthesia*, 60: 1064-1067. doi:10.1111/j.1365-2044.2005.04374.x

Logston Boggs, R., & Wooldridge-King, M. (1995). *Terapia intensiva. Procedimientos de la American Association of Critical-Care Nurses* (3ª ed). Buenos Aires: Panamericana.

Nolan, J.P., Ornato, J.P., Parr, M.J.A., & Soar, G.D. (2015). Resuscitation highlights in 2014. *Resuscitation*, 89, A1-6. doi: 10.1016

Ono, Y., Kakamu, T., Kikuchi, H., Mori, Y., Watanabe, Y., & Shinohara, K. (2018). Expert-performed endotracheal intubation-related complications in trauma patients: incidence, possible risk factors, and outcomes in the prehospital setting and emergency department. *Emergency medicine international*, 2018, 5649476. doi:10.1155/2018/5649476

Peart, O. 2014. Endotracheal Intubation. *Radiologic Technology*, 85(5), 578-579.

Prazeres, G. de A. (2002). Orotracheal Intubation. Retrieved from [www.medstudents.com.br/proced/proced5/intubat.htm](http://www.medstudents.com.br/proced/proced5/intubat.htm)

Thomas, E.B. & Moss, S. (2010) Tracheal intubation. *Anaesthesia and intensive care medicine*, 11 (10): 410-412.



# CHAPTER 3

## Arterial Blood Sample

---

*Sandra Tricas-Sauras & Ingard Coppens*

# Procedure in English: Arterial Blood Sample

---

## 1. Definition of procedure

Arterial blood gas (ABG) collection is the extraction of blood from an artery, primarily to determine arterial blood gases. The sample can be obtained either through a catheter placed in an artery, or by using a needle and syringe to puncture an artery (WHO, 2010).

These syringes are pre-heparinized and handled to minimize air exposure that will alter the blood gas values.

## 2. Therapeutic indications and Contraindications

Most common uses are: laboratory tests for health assessment and clinical management.

ABG sampling provides valuable information on the acid-base balance at a specific point during a patient's illness. It is the only reliable determination of ventilation success as evidenced by CO<sub>2</sub> content.

It constitutes a more precise measure of successful gas exchange and oxygenation. It is the only way of accurately determining the alveolar-arterial oxygen gradient.

### **Contraindications:**

Absolute contraindications for ABG sampling include (Danckers, 2018):

- Abnormal modified Allen test, in which case consideration should be given to attempting puncture at a different site
- Local infection or distorted anatomy at the potential puncture site (e.g, from previous surgical interventions, congenital or acquired malformations, or burns)
- The presence of arteriovenous fistulas or vascular grafts, in which case arterial vascular puncture should not be attempted
- Known or suspected severe peripheral vascular disease of the limb involved

Relative contraindications include the following (Danckers, 2018):

- Severe coagulopathy
- Anticoagulation therapy with warfarin, heparin and derivatives, direct thrombin inhibitors, or factor X inhibitors (aspirin is not a contraindication for arterial vascular sampling in most cases)
- Use of thrombolytic agents, such as streptokinase or tissue plasminogen activator

### 3. Materials

Assemble the following items within safe and easy reach on a tray or trolley, ensuring that all the items are clearly visible (WHO, 2010; NICE, 2003):

- A supply of laboratory sample tubes, which should be stored dry and upright in a rack; blood can be collected in:
  - Sterile glass or plastic tubes with rubber caps (the choice of tube will depend on what is agreed with the laboratory)
  - Vacuum-extraction blood tubes
  - Glass tubes with screw caps
  - A sterile glass or bleeding pack (collapsible) if large quantities of blood are to be collected
- Well-fitting, non-sterile gloves
- An assortment of blood-sampling devices (safety-engineered devices or needles and syringes, see below), of different sizes
- Alcohol hand rub
- 70% alcohol swabs for skin disinfection
- Gauze to be applied over puncture site
- Laboratory specimen labels
- Writing equipment
- Laboratory forms
- Leak-proof transportation bags and containers
- A puncture-resistant sharps container

Additionally, also the following equipment and supplies:

- Pre-heparinized syringe;
- Needles (20, 23 and 25 gauge, of different lengths) – choose a size that is appropriate for the site
- A safety syringe with a needle cover that allows the syringe to be capped before transport, without manually recapping
- A bandage to cover the puncture site after collection
- A container with crushed ice for transportation of the sample to the laboratory (if the analysis is not done at the point of care)
- Where applicable, local anaesthetic and an additional single-use sterile syringe and needle

## 4. Stages of the procedure

Several different arteries can be used for blood collection. The first choice is the radial artery (due to its small size, this procedure requires extensive skill in arterial blood sampling).

Alternative sites: brachial or femoral arteries, but these have several disadvantages in that they may be:

- harder to locate (less superficial than the radial artery)
- have poor collateral circulation
- are surrounded by structures that could be damaged by faulty technique

### **Procedure:**

Following the main guide as stated by WHO (2010) and NICE (2003) best practice guidelines.

- Approach the patient, introduce yourself and ask the patient to state their full name
- Place the patient on their back, lying flat. Ask other nurse for assistance if the patient's position needs to be altered to make them more comfortable
- If the patient is clenching their fist, holding their breath or crying, this can change breathing and thus alter the test result
- Locate the radial artery by performing an Allen test (WHO, 2010) for collateral circulation. If the initial test fails to locate the radial artery, repeat the test on the other hand. Once a puncture site is identified, note anatomic landmarks to be able to find the site again
- Perform hand hygiene, clear off a bedside work area and prepare supplies. Put on an impervious gown or apron, and face protection, if exposure to blood is anticipated
- Disinfect the sampling site on the patient with 70% alcohol and allow it to dry. Put on the non-sterile gloves (if it will be necessary to palpate repeatedly the puncture site, put on sterile gloves)
- If the needle and syringe are not preassembled, assemble the needle and the heparinized syringe and pull the syringe plunger to the required fill level recommended by the local laboratory
- Holding the syringe and needle like a dart, use the index finger to locate the pulse again, inform the patient that the skin is about to be pierced then insert the needle at a 45 degree angle, approximately 1 cm distal to (i.e. away from) the index finger, to avoid contaminating the area where the needle enters the skin

- Advance the needle into the radial artery until a blood flashback appears, then allow the syringe to fill to the appropriate level. DO NOT pull back the syringe plunger
- Withdraw the needle and syringe; place a clean, dry piece of gauze over the site and have the patient or an assistant apply firm pressure for sufficient time to stop the bleeding. Check whether bleeding has stopped after 2–3 minutes. Five minutes or more may be needed for patients who have high blood pressure or a bleeding disorder or are taking anticoagulants
- Activate the mechanisms of a safety needle to cover the needle before placing it in the ice cup. In the absence of a safety-engineered device, use a one-hand scoop technique to recap the needle after removal
- Expel air bubbles, cap the syringe and roll the specimen between the hands to gently mix it. Cap the syringe to prevent contact between the arterial blood sample and the air, and to prevent leaking during transport to the laboratory
- Label the sample syringe
- Dispose appropriately of all used material and personal protective equipment
- Remove gloves and wash hands thoroughly with soap and water, then dry using single-use towels; alternatively, use alcohol rub solution
- Check the patient site for bleeding (if necessary, apply additional pressure) and thank the patient
- Transport the sample immediately to the laboratory, following laboratory handling procedures

## 5. Potential complications and/or aspects to take into account

Complications of ABG sampling may include the following (Danckers, 2018; Eiting et al.; 2019; WHO, 2010):

- Artery vasospasm
- Arterial occlusion
- Air or thrombus embolism
- Haemorrhage
- Local anaesthetic anaphylactic reaction
- Infection at the puncture site
- Local hematoma
- Local pain
- Needle stick injury to health care personnel

- Nerve damage
- Vessel laceration
- Vasovagal response

Other problems can include a drop in blood pressure, complaints of feeling faint, sweating or pallor that may precede a loss of consciousness (WHO, 2010; AARC, 1992).

**Sampling errors:**

Inappropriate collection and handling of arterial blood specimens can lead to incorrect results.

Some reasons for an inaccurate blood result might be (WHO,2010; Larkin et al. 2015):

- Presence of air in the sample
- Collection of venous rather than arterial blood;
- Improper quantity of heparin in the syringe, or improper mixing after blood is drawn
- Delay in specimen transportation

## References

- American Association for Respiratory Care. AARC clinical practice guideline. (1992) Sampling for arterial blood gas analysis. *Respiratory Care*, 8(37), 891–897.
- Asif, M. & Sarkar, P. K. (2007). Three-digit Allen's test. *Annals of Thoracic Surgery*, 84 (2), 686-7.
- Barker, L. (2008). Venipuncture syncope – one occupational health clinic's experience. *Journal of the American Association of Occupational Health Nurses*, 56(4), 139–140.
- Barone, J.E. & Madlinger, R. V. (2006). Should an Allen test be performed before radial artery cannulation? *Journal of Trauma*, 61(2), 468-70.
- Baillie, J.K. (2008). Simple, easily memorised "rules of thumb" for the rapid assessment of physiological compensation for respiratory acid-base disorders. *Thorax*, 63(3), 289-90.
- Bobbia, X., Grandpierre, R.G., Claret, P.G., Moreau, A., Pommet, S., Bonnet, J.M., ... de La Coussaye, J. E. (2013). Ultrasound guidance for radial arterial puncture: a randomized controlled trial. *American Journal of Emergency Medicine*, 31(5), 810-5.
- Brzezinski, M., Luisetti, T. & London, M. J. (2009). Radial artery cannulation: a comprehensive review of recent anatomic and physiologic investigations. *Anesthesia & Analgesia*, 109 (6), 1763-81.
- Calfee, D. & Farr, B. (2002). Comparison of four antiseptic preparations for skin in the prevention of contamination of percutaneously drawn blood cultures: a randomized trial. *Journal of Clinical Microbiology*, 40(5), 1660–1665.
- Castellaa, A., Vallinoa, A., Argenterob, P. A. & Zottia, C. M. (2003). Preventability of percutaneous injuries in healthcare personnel: a year-long survey in Italy. *Journal of Hospital Infection*, 55(4), 290–294.
- Centers for Disease Control and Prevention. (1997). Evaluation of safety devices for preventing percutaneous injuries among health-care personnel during phlebotomy procedures 1993–1995. *Morbidity and Mortality Weekly Report*, 46(2), 21–25. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/00045648.htm>
- So you're going to collect a blood specimen: an introduction to phlebotomy, 12th ed. (2007). USA: College of American Pathologists.
- Cullen, B., Genasi, F., Symington, I., Bagg, J., McCreddie, M., Taylor, A., ... Goldberg, D.J. (2006). Potential for reported needlestick injury prevention among healthcare personnel through safety

device usage and improvement of guideline adherence: expert panel assessment. *Journal of Hospital Infection*, 63(4), 445–451.

Davis, M., Walsh, B., Sittig, S. & Restrepo, R. (2013). AARC clinical practice guideline: blood gas analysis and hemoximetry: 2013. *Respiratory Care*, 58(10), 1694-703.

Danckers, M. (2018). Arterial Blood Gas Sampling. Medscape. <https://emedicine.medscape.com/article/1902703-print>. Updated: Aug 15, 2018.

de Vries, J., van Dorp, W. & van Barneveld, P. (1997). A randomized control trial of alcohol 70% versus alcoholic iodine 2% in skin disinfection before insertion of peripheral infusion catheters. *Journal of Hospital Infection*, 36(4), 317–320.

Dzierba, A. L. & Abraham, P. (2011). A practical approach to understanding acid-base abnormalities in critical illness. *Journal of Pharmacy Practice*, 24 (1), 17-26.

Eiting, E. & Kim, H.T. Arterial puncture and cannulation. In Roberts, J.R., Custalow, C.B., Thomsen, T.W., et al, eds. *Roberts and Hedges' Clinical Procedures in Emergency Medicine and Acute Care*. 7th ed. Philadelphia: Elsevier; 2019. 377-93.

Ford, J. (2008). How to evaluate sharp safety-engineered devices. *Nursing Times*, 104(36), 42–45.

Galena, H. (1992). Complications occurring from diagnostic venepuncture. *Journal of Family Practice*, 34(5), 582–584.

Gilbert, H.C. & Vender, J. S. (1995). Arterial blood gas monitoring. *Critical Care Clinics*, 11(1), 233-48.

Hutin, Y., Hauri, A., Chiarello, L., Catlin, M., Stilwell, B., Ghebrehiwet, T., ... The Members of the Injection Safety Best Practices Development Group. (2003). Best infection control practices for intradermal, subcutaneous and intramuscular needle injections. *Bulletin of the World Health Organization*, 81(7), 491–500.

Kermode, M. (2004). Health worker safety is a prerequisite for injection safety in developing countries. *International Journal of Infectious Diseases*, 8, 325–327.

Lippi, G., Salvagno, G.L., Montagnana, M., Franchini, M. & Guidi, G.C. (2006). Phlebotomy issues and quality improvement in results of laboratory testing. *Clinical Laboratory*, 52, 217–230.

Little, M. A., Hussein, T., Lambert, M. & Dickson, S. J. (2007). Percutaneous blood sampling practice in a large urban hospital. *Clinical Medicine*, 7(3), 243–249.



National Audit Office. (2003). A safer place to work – improving the management of health and safety risks to staff in NHS trusts. London, NDA.

Lamontagne, F., Abiteboul, D., Lolom, I., Pellissier, G., Tarantola, A., Descamps, J.M. & Bouvet, E. (2007). Role of safety-engineered devices in preventing needlestick injuries in 32 French hospitals. *Infection Control and Hospital Epidemiology*, 28(1), 18–23.

Lavery, I. & Ingram, P. (2005). Blood sampling: best practice. *Nursing Standard*, 19, 55–65.

Leitch, A., McCormick, I., Gunn, I. & Gillespie, T. (2006). Reducing the potential for phlebotomy tourniquets to act as a reservoir for meticillin-resistant *Staphylococcus aureus*. *Journal of Hospital Infection*, 63(4), 428–431.

Liumbruno, G. M., Catalano, L., Piccinini, V., Pupella, S. & Grazzini, G. (2009). Reduction of the risk of bacterial contamination of blood components through diversion of the first part of the donation of blood and blood components. *Blood Transfusion*, 7(2), 86–93.

Moor, A.C., Dubbelman, T. M., VanSteveninck, J. & Brand, A. (1999). Transfusion-transmitted diseases: risks, prevention and perspectives. *European Journal of Haematology*, 62(1), 1–8.

National Committee for Clinical Laboratory Standards (2003). Procedures for the collection of diagnostic blood specimens by venipuncture. Approved standard, H3-A5. Wayne, PA: NCCLS

Newman, B. et al. (2007). The effect of a 473-ml (16-oz) water drink on vasovagal donor reaction rates in high school students. *Transfusion*, 47(8), 1524–1533.

NICE (2003). Infection control – prevention of healthcare-associated infections in primary and community care. London: National Institute for Health and Clinical Excellence. Retrieved from: <http://www.nice.org.uk/page.aspx?o=CG002fullguideline;>

Norberg, A. et al. (2003). Contamination rates of blood cultures obtained by dedicated phlebotomy vs intra venous catheter. *Journal of the American Medical Association*, 289(6):726–729.

Patout M., Lamia B., Lhuillier E., Molano L.C., Viacroze C., Benhamou D., et al. (2015). A Randomized Controlled Trial on the Effect of Needle Gauge on the Pain and Anxiety Experienced during Radial Arterial Puncture. *PLoS One*, 10 (9). e0139432.

Pratt R.J. et al. (2007) epic2: National evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. *Journal of Hospital Infection*, 65(Suppl 1):S1–S59.

- Pendergraph G. (1992). Handbook of phlebotomy. Philadelphia: Lea &Febiger. 3rd ed.
- Perry J. & Jagger J. (2003). EPINet data report: injuries from phlebotomy needles. *Advances in Exposure Prevention*, 6(4):43–45.
- Raffin T.A. (1986). Indications for arterial blood gas analysis. *Annals of Internal Medicine*, 105 (3):390-8.
- Rourke, C., Bates, C. & Read, R. (2001). Poor hospital infection control practice in blood sampling and use of tourniquets. *Journal of Hospital Infection*, 49(1), 59–61.
- Ruengsakulrach, P., Brooks, M., Hare, D.L., Gordon, I. & Buxton, B.F. (2001). Preoperative assessment of hand circulation by means of Doppler ultrasonography and the modified Allen test. *Journal of Thoracic and Cardiovascular Surgery*, 121 (3):526-31.
- Rutala, W., Weber, D., Committee HICPA (2008). Guidelines for disinfection and sterilization in healthcare facilities 2008. Atlanta, GA: Centers for Disease Control and Prevention. Retrieved from [http://www.cdc.gov/ncidod/dhap/pdf/guidelines/Disinfection\\_nov\\_2008.pdf](http://www.cdc.gov/ncidod/dhap/pdf/guidelines/Disinfection_nov_2008.pdf)
- Sacar, S. et al. (2006). Poor hospital infection control practice in hand hygiene, glove utilization, and usage of tourniquets. *American Journal of Infection Control*, 34(9):606–609.
- Sagy, M., Barzilay, Z. & Boichis, H. (1988). The diagnosis and management of acid-base imbalance. *Pediatric Emergency Care*, 4 (4):259-65.
- Scerbo, M. et al. (2006). The efficacy of a medical virtual reality simulator for training phlebotomy. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 48(1):72–84.
- Ter Haar, H. (2017). *Mechanische beademing op de intensive care*. Houten: Bohn Stafleu van Loghum. ISBN: 978-90-368-1589-5
- Wade, R.G., Crawford, J., Wade, D. & Holland, R. (2015). Radial artery blood gas sampling: a randomized controlled trial of lidocaine local anesthesia. *Journal of Evidence Based Medicine*, 8 (4), 185-91.
- Wagner, D. et al. (2004). Nosocomial acquisition of dengue. *Emerging Infectious Diseases*, 10(10), 1872–1873.
- Webster, J., Bell-Syer, S. & Foxlee, R. (2009). Skin preparation with alcohol versus alcohol followed by any antiseptic for preventing bacteraemia or contamination of blood for transfusion. *Cochrane Database of Systematic Reviews*, Issue 3. Art. No.: CD007948.

DOI:10.1002/14651858.CD007948. Retrieved from  
<http://mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD007948/frame.html>

WHO (2008). Guidelines on post exposure prophylaxis (PEP) to prevent human immunodeficiency virus (HIV) infection. Geneva, World Health Organization and International Labour Organization. Retrieved from  
<http://www.who.int/hiv/pub/guidelines/PEP/en/index.html>

WHO (2003). Guiding principles to ensure injection device security. Geneva, World Health Organization. Recuperado de: <http://apps.who.int/medicinedocs/en/d/Js4886e/>

WHO (2009). Guidelines on hand hygiene in healthcare. Geneva, World Health Organization. Retrieved from [http://whqlibdoc.who.int/publications/2009/9789241597906\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf)

WHO (2009). Blood transfusion safety. Geneva, World Health Organization. Retrieved from [http://www.who.int/bloodsafety/en/Blood\\_Transfusion\\_Safety.pdf](http://www.who.int/bloodsafety/en/Blood_Transfusion_Safety.pdf)

WHO (2009). 52 Basic requirements for blood transfusion services. Geneva: World Health Organization.

WHO (2007). Performance specification for sharps containers. Geneva: World Health Organization. Retrieved from  
[http://www.who.int/immunization\\_standards/vaccine\\_quality/who\\_pqs\\_e10\\_sb01.pdf](http://www.who.int/immunization_standards/vaccine_quality/who_pqs_e10_sb01.pdf);

WHO (2010). Guidelines on Drawing Blood: Best Practices in Phlebotomy. Geneva: World Health Organization. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK138665/>

Wilburn, S.E. & Eijkemans, G. (2004). Preventing needlestick injuries among healthcare workers: a WHO/ICN collaboration. *International Journal of Occupational and Environmental Health*, 2004, 10(4), 451–456.

Zimmerman, J.L. & Dellinger, R.P. (1996). Blood gas monitoring. *Critical Care Clinics*, 12 (4):865-74.

## Procedure in Spanish: Muestra de Sangre Arterial

---

### 1. Definición del procedimiento

La recogida de muestra de gases en sangre arterial basal (GAB) es la extracción de sangre de una arteria para determinar los gases en sangre arterial. La muestra se puede obtener a través de un catéter colocado en una arteria o usando una aguja y una jeringa para perforar una arteria (OMS, 2010).

Estas jeringas están pre-heparinizadas y se utilizan para minimizar la exposición al aire que alteraría los valores de los gases en sangre.

### 2. Indicaciones terapéuticas y contraindicaciones

Los usos más comunes son: pruebas de laboratorio para la evaluación de la salud y el manejo clínico.

La muestra GAB proporciona información valiosa sobre el equilibrio ácido-base en un momento específico durante la enfermedad de un paciente. Es la única determinación fiable del éxito de ventilación ya que determina el contenido de CO<sub>2</sub> en sangre.

Constituye la medida más precisa del intercambio exitoso de gases y la oxigenación. Es la única forma de determinar con precisión el gradiente de oxígeno alveolo-arterial.

#### **Contraindicaciones:**

Las contraindicaciones absolutas para la muestra GAB incluyen (Danckers, 2018):

- Test de Allen modificado anormal, en cuyo caso se debe considerar intentar la punción en un sitio diferente
- Infección local o anatomía distorsionada en el lugar potencial de la punción (por ejemplo, por intervenciones quirúrgicas anteriores, malformaciones congénitas o adquiridas, o quemaduras)
- La presencia de fístulas arteriovenosas o injertos vasculares, en cuyo caso no debe intentarse la punción vascular arterial
- Enfermedad vascular periférica grave conocida o sospechada en la extremidad afectada

Las contraindicaciones relativas incluyen las siguientes (Danckers, 2018):

- Coagulopatía severa
- Terapia de anticoagulación con warfarina, heparina y derivados, inhibidores directos de la trombina o inhibidores del factor X (en la mayoría de los casos, la aspirina no es una contraindicación para la muestra de sangre arterial)
- Uso de agentes trombolíticos, como estreptoquinasa o activador tisular del plasminógeno

### 3. Materiales

Reúna los siguientes materiales de manera segura y fácil en una bandeja o carro, asegurándose de que todos los elementos sean claramente visibles (OMS, 2010; NICE, 2003):

- Jeringa heparinizada y aguja
- Guantes bien ajustados, no estériles
- Una variedad de dispositivos para la toma de muestras de sangre (dispositivos de seguridad, o agujas y jeringas, ver más abajo), de diferentes tamaños
- Solución hidroalcohólica
- Alcohol al 70% para la desinfección de la piel
- Gasa para aplicar sobre el sitio de punción
- Etiquetas de muestras de laboratorio.
- Equipo de escritura
- Formularios de laboratorio
- Bolsas y contenedores de transporte a prueba de fuego
- Contenedor de objetos punzantes

Además, también es necesario los siguientes equipos y suministros:

- Jeringa pre-heparinizada
- Agujas (calibre 20G, 23G y 25G, de diferentes longitudes): elija un tamaño que sea apropiado para el sitio de punción
- Una jeringa de seguridad con una cubierta de aguja que permite tapar la jeringa antes del transporte, sin volver a tapar manualmente
- Un vendaje para cubrir el sitio de punción después de la recogida de muestra
- Contenedor con hielo triturado para el transporte de la muestra al laboratorio (si el análisis no se realiza en el punto de atención)

- Si corresponde, anestesia local y una jeringa y aguja estériles, adicionales, de un solo uso

#### 4. Pasos del procedimiento

Se pueden usar varias arterias diferentes para la extracción de sangre. La primera opción es la arteria radial; debido a su pequeño tamaño este procedimiento requiere una gran experiencia en la extracción de muestras de sangre arterial. Existen sitios de punción alternativos, como las arterias braquiales o femorales, pero tienen varias desventajas ya que pueden:

- Ser más difíciles de ubicar (ya que son menos superficiales que la arteria radial)
- Tener mala circulación colateral
- Estar rodeados de estructuras que podrían dañarse por una técnica defectuosa

##### **Procedimiento:**

Siguiendo la guía principal y según lo establecido por las guías de buenas prácticas (WHO, 2010; NICE, 2003):

- Acérquese al paciente, preséntese y pídale que diga su nombre completo
- Coloque al paciente boca arriba, acostado en posición horizontal. Pídale ayuda a otra enfermera si necesita modificar la posición del paciente para que se sienta más cómodo
- Si el paciente aprieta el puño, aguanta la respiración o llora, puede cambiar el patrón respiratorio y alterar el resultado de la prueba
- Localice la arteria radial realizando el Test de Allen (OMS, 2010) para la circulación colateral. Si la prueba inicial no localiza la arteria radial, repita la prueba en el otro lado. Una vez que se identifica el punto de punción observe los puntos de referencia anatómicos para poder encontrar el sitio nuevamente
- Realice la higiene de las manos, limpie el área de trabajo junto a la cama y prepare los materiales. Póngase una bata o delantal impermeable y protéjase la cara si se anticipa que pueda haber exposición a sangre
- Desinfecte el sitio de punción en el paciente con alcohol al 70% y deje que se seque. Póngase los guantes no estériles (si es necesario palpar repetidamente el lugar de la punción, póngase guantes estériles)
- Si la aguja y la jeringa no están premontadas, monte la aguja y la jeringa heparinizada, y tire del émbolo de la jeringa hasta el nivel de llenado requerido recomendado por el laboratorio

- Sosteniendo la jeringa y la aguja como un dardo, use el dedo índice para volver a localizar el pulso, informe al paciente del pinchazo e inserte la aguja en un ángulo de 45 grados, aproximadamente 1 cm lejos del dedo índice, para evitar contaminar el área donde la aguja entra en la piel
- Haga avanzar la aguja hacia la arteria radial hasta que aparezca un reflujo de sangre pulsátil, luego permita que la jeringa se llene hasta el nivel adecuado. No tire del émbolo de la jeringa
- Retire la aguja y la jeringa. Coloque una gasa limpia y seca sobre el sitio de punción y haga que el paciente o un asistente apliquen una presión firme durante el tiempo suficiente para detener el sangrado. Compruebe si éste se ha detenido después de 2 ó 3 minutos. Es posible que se necesiten cinco minutos o más para los pacientes que tienen presión arterial alta, un trastorno hemorrágico, o que estén tomando anticoagulantes
- Active los mecanismos de seguridad de la aguja para cubrirla antes de colocarla en la copa de hielo. En ausencia de dispositivo de seguridad utilice la técnica de cuchara con una sola mano para volver a tapar la aguja después de retirarla
- Expulse las burbujas de aire, tape la jeringa y haga rodar la muestra entre las manos para mezclarla suavemente. Tape la jeringa para evitar el contacto entre la muestra de sangre arterial y el aire, y para evitar fugas durante el transporte al laboratorio
- Etiquete la jeringa de la muestra
- Deseche apropiadamente todo el material usado y el equipo de protección personal
- Quítese los guantes y lávese bien las manos con agua y jabón, luego séquelos con toallas de un solo uso; alternativamente, use una solución de alcohol
- Revise el sitio de punción para ver si hay sangrado (si es necesario, aplique presión adicional) y agradezca al paciente su colaboración
- Transporte la muestra inmediatamente al laboratorio siguiendo los procedimientos de manipulación del laboratorio

## 5. Complicaciones potenciales y/o aspectos a considerar

Las complicaciones en la recogida de muestra de sangre arterial pueden incluir las siguientes (Danckers, 2018; Eiting et al.; 2019; OMS, 2010):

- Vasoespasmo arterial
- Oclusión arterial
- Embolismo o trombo

- Hemorragia
- Reacción a la anestesia local
- Infección en el sitio de punción
- Hematoma local
- Dolor local
- Lesión del personal sanitario por pinchazo accidental con aguja
- Lesión nerviosa
- Laceración de la arteria
- Respuesta vasovagal

Otros problemas que pueden darse: hipotensión, quejas por sensación de desmayo, sudoración o palidez que pueden preceder a una pérdida de conciencia (OMS, 2010; AARC, 1992).

#### **ERRORES DE RECOGIDA DE LA MUESTRA**

La recolección y manipulación inapropiadas de muestras de sangre arterial pueden llevar a resultados incorrectos. Algunas razones para un resultado inexacto podrían ser (OMS, 2010; Larkin et al. 2015).

- Presencia de aire en la muestra
- Extracción de sangre venosa en vez de arterial
- Cantidad inadecuada de heparina en la jeringa o una mezcla inadecuada después de extraer la sangre
- Retraso en el transporte de muestras



## Referencias

American Association for Respiratory Care. AARC clinical practice guideline. (1992) Sampling for arterial blood gas analysis. *Respiratory Care*, 8(37), 891–897.

Asif, M. & Sarkar, P. K. (2007). Three-digit Allen's test. *Annals of Thoracic Surgery*, 84 (2), 686-7.

Barker, L. (2008). Venipuncture syncope – one occupational health clinic's experience. *Journal of the American Association of Occupational Health Nurses*, 56(4), 139–140.

Barone, J.E. & Madlinger, R. V. (2006). Should an Allen test be performed before radial artery cannulation? *Journal of Trauma*, 61(2), 468-70.

Baillie, J.K. (2008). Simple, easily memorised "rules of thumb" for the rapid assessment of physiological compensation for respiratory acid-base disorders. *Thorax*, 63(3), 289-90.

Bobbia, X., Grandpierre, R.G., Claret, P.G., Moreau, A., Pommet, S., Bonnet, J.M., ... de La Coussaye, J. E. (2013). Ultrasound guidance for radial arterial puncture: a randomized controlled trial. *American Journal of Emergency Medicine*, 31(5), 810-5.

Brzezinski, M., Luisetti, T. & London, M. J. (2009). Radial artery cannulation: a comprehensive review of recent anatomic and physiologic investigations. *Anesthesia & Analgesia*, 109 (6), 1763-81.

Calfee, D. & Farr, B. (2002). Comparison of four antiseptic preparations for skin in the prevention of contamination of percutaneously drawn blood cultures: a randomized trial. *Journal of Clinical Microbiology*, 40(5), 1660–1665.

Castellaa, A., Vallinoa, A., Argenterob, P. A. & Zottia, C. M. (2003). Preventability of percutaneous injuries in healthcare personnel: a year-long survey in Italy. *Journal of Hospital Infection*, 55(4), 290–294.

Centers for Disease Control and Prevention. (1997). Evaluation of safety devices for preventing percutaneous injuries among health-care personnel during phlebotomy procedures 1993–1995. *Morbidity and Mortality Weekly Report*, 46(2), 21–25. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/00045648.htm>

So you're going to collect a blood specimen: an introduction to phlebotomy, 12th ed. (2007). USA: College of American Pathologists.

Cullen, B., Genasi, F., Symington, I., Bagg, J., McCreddie, M., Taylor, A., ... Goldberg, D.J. (2006). Potential for reported needlestick injury prevention among healthcare personnel through safety

device usage and improvement of guideline adherence: expert panel assessment. *Journal of Hospital Infection*, 63(4), 445–451.

Davis, M., Walsh, B., Sittig, S. & Restrepo, R. (2013). AARC clinical practice guideline: blood gas analysis and hemoximetry: 2013. *Respiratory Care*, 58(10), 1694-703.

Danckers, M. (2018). Arterial Blood Gas Sampling. Medscape. <https://emedicine.medscape.com/article/1902703-print>. Updated: Aug 15, 2018.

de Vries, J., van Dorp, W. & van Barneveld, P. (1997). A randomized control trial of alcohol 70% versus alcoholic iodine 2% in skin disinfection before insertion of peripheral infusion catheters. *Journal of Hospital Infection*, 36(4), 317–320.

Dzierba, A. L. & Abraham, P. (2011). A practical approach to understanding acid-base abnormalities in critical illness. *Journal of Pharmacy Practice*, 24 (1), 17-26.

Eiting, E. & Kim, H.T. Arterial puncture and cannulation. In Roberts, J.R., Custalow, C.B., Thomsen, T.W., et al, eds. *Roberts and Hedges' Clinical Procedures in Emergency Medicine and Acute Care*. 7th ed. Philadelphia: Elsevier; 2019. 377-93.

Ford, J. (2008). How to evaluate sharp safety-engineered devices. *Nursing Times*, 104(36), 42–45.

Galena, H. (1992). Complications occurring from diagnostic venepuncture. *Journal of Family Practice*, 34(5), 582–584.

Gilbert, H.C. & Vender, J. S. (1995). Arterial blood gas monitoring. *Critical Care Clinics*, 11(1), 233-48.

Hutin, Y., Hauri, A., Chiarello, L., Catlin, M., Stilwell, B., Ghebrehiwet, T., The Members of the Injection Safety Best Practices Development Group. (2003). Best infection control practices for intradermal, subcutaneous and intramuscular needle injections. *Bulletin of the World Health Organization*, 81(7), 491–500.

Kermode, M. (2004). Health worker safety is a prerequisite for injection safety in developing countries. *International Journal of Infectious Diseases*, 8, 325–327.

Lippi, G., Salvagno, G.L., Montagnana, M., Franchini, M. & Guidi, G.C. (2006). Phlebotomy issues and quality improvement in results of laboratory testing. *Clinical Laboratory*, 52, 217–230.

Little, M. A., Hussein, T., Lambert, M. & Dickson, S. J. (2007). Percutaneous blood sampling practice in a large urban hospital. *Clinical Medicine*, 7(3), 243–249.

National Audit Office. (2003). A safer place to work – improving the management of health and safety risks to staff in NHS trusts. London, NDA.

Lamontagne, F., Abiteboul, D., Lolom, I., Pellissier, G., Tarantola, A., Descamps, J.M. & Bouvet, E. (2007). Role of safety-engineered devices in preventing needlestick injuries in 32 French hospitals. *Infection Control and Hospital Epidemiology*, 28(1), 18–23.

Lavery, I. & Ingram, P. (2005). Blood sampling: best practice. *Nursing Standard*, 19, 55–65.

Leitch, A., McCormick, I., Gunn, I. & Gillespie, T. (2006). Reducing the potential for phlebotomy tourniquets to act as a reservoir for meticillin-resistant *Staphylococcus aureus*. *Journal of Hospital Infection*, 63(4), 428–431.

Liumbruno, G. M., Catalano, L., Piccinini, V., Pupella, S. & Grazzini, G. (2009). Reduction of the risk of bacterial contamination of blood components through diversion of the first part of the donation of blood and blood components. *Blood Transfusion*, 7(2), 86–93.

Moor, A.C., Dubbelman, T. M., VanSteveninck, J. & Brand, A. (1999). Transfusion-transmitted diseases: risks, prevention and perspectives. *European Journal of Haematology*, 62(1), 1–8.

National Committee for Clinical Laboratory Standards (2003). Procedures for the collection of diagnostic blood specimens by venipuncture. Approved standard, H3-A5. Wayne, PA: NCCLS

Newman, B. et al. (2007). The effect of a 473-ml (16-oz) water drink on vasovagal donor reaction rates in high school students. *Transfusion*, 47(8), 1524–1533.

NICE (2003). Infection control – prevention of healthcare-associated infections in primary and community care. London: National Institute for Health and Clinical Excellence. Retrieved from: <http://www.nice.org.uk/page.aspx?o=CG002fullguideline;>

Norberg, A. et al. (2003). Contamination rates of blood cultures obtained by dedicated phlebotomy vs intra venous catheter. *Journal of the American Medical Association*, 289(6):726–729.

Patout M., Lamia B., Lhuillier E., Molano L.C., Viacroze C., Benhamou D., et al. (2015). A Randomized Controlled Trial on the Effect of Needle Gauge on the Pain and Anxiety Experienced during Radial Arterial Puncture. *PLoS One*, 10 (9). e0139432.

Pratt R.J. et al. (2007) epic2: National evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. *Journal of Hospital Infection*, 65(Suppl 1):S1–S59.

- Pendergraph G. (1992). Handbook of phlebotomy. Philadelphia: Lea &Febiger. 3rd ed.
- Perry J. & Jagger J. (2003). EPINet data report: injuries from phlebotomy needles. *Advances in Exposure Prevention*, 6(4):43–45.
- Raffin T.A. (1986). Indications for arterial blood gas analysis. *Annals of Internal Medicine*, 105 (3):390-8.
- Rourke, C., Bates, C. & Read, R. (2001). Poor hospital infection control practice in blood sampling and use of tourniquets. *Journal of Hospital Infection*, 49(1), 59–61.
- Ruengsakulrach, P., Brooks, M., Hare, D.L., Gordon, I. & Buxton, B.F. (2001). Preoperative assessment of hand circulation by means of Doppler ultrasonography and the modified Allen test. *Journal of Thoracic and Cardiovascular Surgery*, 121 (3):526-31.
- Rutala, W., Weber, D., Committee HICPA (2008). Guidelines for disinfection and sterilization in healthcare facilities 2008. Atlanta, GA: Centers for Disease Control and Prevention. Retrieved from [http://www.cdc.gov/ncidod/dhap/pdf/guidelines/Disinfection\\_nov\\_2008.pdf](http://www.cdc.gov/ncidod/dhap/pdf/guidelines/Disinfection_nov_2008.pdf)
- Sacar, S. et al. (2006). Poor hospital infection control practice in hand hygiene, glove utilization, and usage of tourniquets. *American Journal of Infection Control*, 34(9):606–609.
- Sagy, M., Barzilay, Z. & Boichis, H. (1988). The diagnosis and management of acid-base imbalance. *Pediatric Emergency Care*, 4 (4):259-65.
- Scerbo, M. et al. (2006). The efficacy of a medical virtual reality simulator for training phlebotomy. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 48(1):72–84.
- Ter Haar, H. (2017). *Mechanische beademing op de intensive care*. Houten: Bohn Stafleu van Loghum. ISBN: 978-90-368-1589-5
- Wade, R.G., Crawford, J., Wade, D. & Holland, R. (2015). Radial artery blood gas sampling: a randomized controlled trial of lidocaine local anesthesia. *Journal of Evidence Based Medicine*, 8 (4), 185-91.
- Wagner, D. et al. (2004). Nosocomial acquisition of dengue. *Emerging Infectious Diseases*, 10(10), 1872–1873.
- Webster, J., Bell-Syer, S. & Foxlee, R. (2009). Skin preparation with alcohol versus alcohol followed by any antiseptic for preventing bacteraemia or contamination of blood for transfusion. *Cochrane Database of Systematic Reviews*, Issue 3. Art. No.: CD007948.

DOI:10.1002/14651858.CD007948. Retrieved from  
<http://mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD007948/frame.html>

WHO (2008). Guidelines on post exposure prophylaxis (PEP) to prevent human immunodeficiency virus (HIV) infection. Geneva, World Health Organization and International Labour Organization. Retrieved from  
<http://www.who.int/hiv/pub/guidelines/PEP/en/index.html>

WHO (2003). Guiding principles to ensure injection device security. Geneva, World Health Organization. Recuperado de: <http://apps.who.int/medicinedocs/en/d/Js4886e/>

WHO (2009). Guidelines on hand hygiene in healthcare. Geneva, World Health Organization. Retrieved from [http://whqlibdoc.who.int/publications/2009/9789241597906\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf)

WHO (2009). Blood transfusion safety. Geneva, World Health Organization. Retrieved from [http://www.who.int/bloodsafety/en/Blood\\_Transfusion\\_Safety.pdf](http://www.who.int/bloodsafety/en/Blood_Transfusion_Safety.pdf)

WHO (2009). 52 Basic requirements for blood transfusion services. Geneva: World Health Organization.

WHO (2007). Performance specification for sharps containers. Geneva: World Health Organization. Retrieved from  
[http://www.who.int/immunization\\_standards/vaccine\\_quality/who\\_pqs\\_e10\\_sb01.pdf](http://www.who.int/immunization_standards/vaccine_quality/who_pqs_e10_sb01.pdf);

WHO (2010). Guidelines on Drawing Blood: Best Practices in Phlebotomy. Geneva: World Health Organization. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK138665/>

Wilburn, S.E. & Eijkemans, G. (2004). Preventing needlestick injuries among healthcare workers: a WHO/ICN collaboration. *International Journal of Occupational and Environmental Health*, 2004, 10(4), 451–456.

Zimmerman, J.L. & Dellinger, R.P. (1996). Blood gas monitoring. *Critical Care Clinics*, 12 (4):865-74.

# Procedure in Portuguese: Colheita De Sangue Arterial

---

## 1. Definição de processo

A amostragem para gasometria arterial é a extração de sangue de uma artéria, principalmente para determinar os gases sanguíneos arteriais. A amostra pode ser obtida através de uma cateterização numa artéria, ou usando uma agulha e seringa para punção de uma artéria (OMS, 2010).

Estas seringas são pré-heparinizadas e tratadas para minimizar a exposição ao ar que irá alterar os valores dos gases sanguíneos.

## 2. Indicações terapêuticas e Contraindicações

Os usos mais comuns são: testes laboratoriais para avaliação do estado de saúde e gestão clínica.

A amostragem para gasometria arterial fornece informações valiosas sobre o equilíbrio ácido-básico num momento específico durante o processo de doença do doente. É a única forma fiável de determinar o sucesso de ventilação conforme evidenciado pelo conteúdo de CO<sub>2</sub>.

Constitui uma medição mais precisa das trocas gasosas e da oxigenação bem-sucedidas. É a única forma de determinar, com precisão, a diferença alvéolo-arterial de oxigénio.

### **Contraindicações:**

As contraindicações absolutas para a amostragem de gasometria arterial incluem (Danckers, 2018):

- Teste de Allen modificado anormal, e nesse caso deve considerar-se tentar a punção noutra local
- Infecção local ou anatomia distorcida com o potencial da punção (por ex., a partir de intervenções cirúrgicas prévias, malformações congénitas ou adquiridas, ou queimaduras)
- A presença de fístulas arteriovenosas ou enxertos vasculares, caso em que a punção vascular arterial não deve ser realizada
- Doença vascular periférica grave do membro envolvido, conhecida ou suspeita

As contraindicações relativas incluem (Danckers, 2018):

- Coagulopatia grave

- Terapia de anticoagulação com varfarina, heparina e derivados, inibidores de trombina diretos ou inibidores de fator X (a aspirina não é uma contraindicação para a amostragem vascular arterial na maioria dos casos)
- Uso de trombolíticos, tais como a estreptoquinase ou do ativador do plasminogénio tecidual

### 3. Materiais

Reúna os seguintes itens ao seu alcance de forma segura e fácil numa bandeja ou carrinho, garantindo que todos os itens estão claramente visíveis (WHO, 2010; NICE, 2003):

- Um conjunto de tubos de amostra laboratorial, que deve ser armazenado seco e vertical numa prateleira; o sangue pode ser recolhido em:
  - Tubos esterilizados de vidro ou plástico com tampas de borracha (a escolha do tubo vai depender do acordado com o laboratório)
  - Tubos de extração sanguínea em vácuo
  - Tubos de vidro com tampas de rosca
- Um frasco esterilizado ou bolsa de sangue (colapsável) caso se vá recolher grandes quantidades de sangue
- Luvas não esterilizadas e justas
- Uma variedade de dispositivos de recolha de sangue (dispositivos com sistema de segurança ou agulhas e seringas, ver abaixo), de diferentes tamanhos
- Álcool para desinfetar as mãos
- Compressas embebidas em álcool a 70% para desinfeção da pele
- Gaze para ser aplicada sobre o local da punção
- Etiquetas de laboratório
- Material de escrita
- Formulários de laboratório
- Sacos de transporte e contentores à prova de fugas
- Um recipiente para objetos afiados resistente a punções

Além disso, também os seguintes equipamentos e materiais:

- Seringa pré-heparinizada
- Agulhas (20G, 23G e 25G, de comprimentos diferentes) - Escolha um tamanho que seja apropriado para o local

- Uma seringa e agulha com sistema de segurança que permita cobrir a seringa antes do transporte, sem ser necessário cobri-la de novo manualmente
- Um penso para cobrir o local da punção após a colheita
- Um recipiente com gelo picado para o transporte da amostra para o laboratório (se a análise não for feita no local de atendimento)
- Quando aplicável, anestésico local e uma seringa com agulha estéril de uso único adicional

#### 4. Fases do procedimento

Podem usar-se várias artérias diferentes para a colheita de sangue. A primeira escolha é a artéria radial (devido ao seu pequeno tamanho, este procedimento requer grande habilidade em amostras de sangue arterial).

Locais alternativos: artéria braquial ou femoral, mas estas têm várias desvantagens na medida em que podem ser:

- Mais difíceis de localizar (menos superficiais do que a artéria radial)
- Têm fraca circulação colateral
- Estão rodeadas de estruturas que poderiam ser danificadas por falha técnica

#### **Procedimento:**

Seguindo o guia principal conforme as melhores orientações práticas da OMS (2010) e NICE (2003).

- Aborde o doente, apresente-se e peça ao doente para dizer o seu nome completo
- Coloque o doente em decúbito dorsal. Peça ajuda a outro enfermeiro, caso a posição do doente precise de ser alterada para ficar mais confortável
- Se o doente fechar o punho, sustar a respiração ou chorar, pode alterar a respiração e, assim, alterar o resultado do teste
- Localize a artéria radial, executando um teste de Allen (OMS, 2010) para verificar a circulação colateral. Se o teste não conseguir localizar a artéria radial, repita o teste com a outra mão. Assim que identificar um local para a punção, registre quaisquer marcos anatómicos para ser capaz de encontrar o local novamente
- Realize a higiene das mãos, disponha de uma área de trabalho desimpedida junto à cabeceira e prepare os equipamentos. Vista uma bata ou avental impermeável, e coloque proteção facial, se prevê exposição ao sangue



- Desinfete o local de amostragem no doente com álcool a 70% e deixe secar. Calce as luvas não estéreis (se for necessário palpar repetidamente o local de punção, calce luvas estéreis)
- Se a agulha e seringa não forem pré-montadas, adapte a agulha e a seringa heparinizada e puxe o êmbolo da seringa para o nível de enchimento recomendado pelo laboratório local
- Segurando a seringa e agulha como um dardo, use o dedo indicador para localizar o pulso uma vez mais, informe o doente de que a pele está prestes a ser puncionada e, em seguida, insira a agulha a um ângulo de 45°, aproximadamente a 1 cm de distância do dedo indicador, para evitar a contaminação da área onde a agulha entra na pele
- Continue a progressão da agulha na artéria radial até surgir sangue no interior da seringa e, em seguida, espere até que a seringa encha até ao nível apropriado. NÃO puxe o êmbolo da seringa
- Retire a agulha e a seringa; coloque uma gaze limpa e seca sobre o local. Peça ao doente ou a um assistente para aplicar pressão firme durante tempo suficiente para a hemostase do sangue. Verifique se o sangue estancou após 2-3 minutos. Podem ser precisos cinco minutos ou mais para pacientes com pressão arterial elevada ou distúrbio hemorrágico ou que tomam anticoagulantes
- Ative os mecanismos de segurança da agulha ao proteger a agulha antes de a colocar no recipiente com gelo. Na ausência de um dispositivo de segurança, use a técnica de recapsular a agulha com uma única mão, após a remoção
- Expulse as bolhas de ar, capsule a seringa e rode a amostra entre as mãos para misturá-la com cuidado. Capsule a seringa para evitar o contacto entre a amostra de sangue arterial e o ar, e para evitar extravazamento durante o transporte para o laboratório
- Rotule a seringa da amostragem
- Descarte adequadamente todos os materiais utilizados e equipamentos de proteção individual
- Descalce as luvas e lave bem as mãos com água e sabão e, em seguida, seque com toalhas descartáveis; em alternativa, esfregue as mãos com álcool
- Verifique a hemóstase do local de punção (se necessário, aplique mais pressão) e agradeça ao doente
- Transporte a amostra imediatamente para o laboratório, seguindo os procedimentos de manuseio de laboratório

## 5. Possíveis complicações e/ou aspetos a ter em conta

As complicações da amostragem para gasometria arterial podem incluir (Danckers, 2018; Eiting et al., 2019; OMS, 2010):

- Vasoespasma arterial
- Oclusão arterial
- Embolia aérea ou tromboembolia
- Hemorragia
- Reação anafilática a anestésico local
- Infeção no local de punção
- Hematoma local
- Dor local
- Picada de agulha em profissionais de saúde
- Danos nos nervos
- Laceração do vaso
- Síncope vasovagal

Outros problemas podem incluir: hipotensão arterial, queixas de sensação de fraqueza, sudação ou palidez que pode preceder a perda de consciência (OMS, 2010; AARC, 1992).

### **ERROS DE AMOSTRAGEM**

A recolha inadequada e o manuseio de amostras de sangue arterial podem levar a resultados incorretos. Algumas razões para resultados alterados na análise do sangue (OMS, 2010; Larkin et al. 2015).

- Presença de ar na amostra
- Colheita de sangue venoso, em vez de arterial
- Quantidade inadequada de heparina na seringa, ou mistura inadequada após a colheita de sangue
- Atraso no transporte da amostra

## Referências Bibliográficas

American Association for Respiratory Care. AARC clinical practice guideline. (1992) Sampling for arterial blood gas analysis. *Respiratory Care*, 8(37), 891–897.

Asif, M. & Sarkar, P. K. (2007). Three-digit Allen's test. *Annals of Thoracic Surgery*, 84 (2), 686-7.

Barker, L. (2008). Venipuncture syncope – one occupational health clinic's experience. *Journal of the American Association of Occupational Health Nurses*, 56(4), 139–140.

Barone, J.E. & Madlinger, R. V. (2006). Should an Allen test be performed before radial artery cannulation? *Journal of Trauma*, 61(2), 468-70.

Baillie, J.K. (2008). Simple, easily memorised "rules of thumb" for the rapid assessment of physiological compensation for respiratory acid-base disorders. *Thorax*, 63(3), 289-90.

Bobbia, X., Grandpierre, R.G., Claret, P.G., Moreau, A., Pommet, S., Bonnet, J.M., ... de La Coussaye, J. E. (2013). Ultrasound guidance for radial arterial puncture: a randomized controlled trial. *American Journal of Emergency Medicine*, 31(5), 810-5.

Brzezinski, M., Luisetti, T. & London, M. J. (2009). Radial artery cannulation: a comprehensive review of recent anatomic and physiologic investigations. *Anesthesia & Analgesia*, 109 (6), 1763-81.

Calfee, D. & Farr, B. (2002). Comparison of four antiseptic preparations for skin in the prevention of contamination of percutaneously drawn blood cultures: a randomized trial. *Journal of Clinical Microbiology*, 40(5), 1660–1665.

Castellaa, A., Vallinoa, A., Argenterob, P. A. & Zottia, C. M. (2003). Preventability of percutaneous injuries in healthcare personnel: a year-long survey in Italy. *Journal of Hospital Infection*, 55(4), 290–294.

Centers for Disease Control and Prevention. (1997). Evaluation of safety devices for preventing percutaneous injuries among health-care personnel during phlebotomy procedures 1993–1995. *Morbidity and Mortality Weekly Report*, 46(2), 21–25. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/00045648.htm>

So you're going to collect a blood specimen: an introduction to phlebotomy, 12th ed. (2007). USA: College of American Pathologists.

Cullen, B., Genasi, F., Symington, I., Bagg, J., McCreddie, M., Taylor, A., ... Goldberg, D.J. (2006). Potential for reported needlestick injury prevention among healthcare personnel through safety

device usage and improvement of guideline adherence: expert panel assessment. *Journal of Hospital Infection*, 63(4), 445–451.

Davis, M., Walsh, B., Sittig, S. & Restrepo, R. (2013). AARC clinical practice guideline: blood gas analysis and hemoximetry: 2013. *Respiratory Care*, 58(10), 1694-703.

Danckers, M. (2018). Arterial Blood Gas Sampling. Medscape. <https://emedicine.medscape.com/article/1902703-print>. Updated: Aug 15, 2018.

de Vries, J., van Dorp, W. & van Barneveld, P. (1997). A randomized control trial of alcohol 70% versus alcoholic iodine 2% in skin disinfection before insertion of peripheral infusion catheters. *Journal of Hospital Infection*, 36(4), 317–320.

Dzierba, A. L. & Abraham, P. (2011). A practical approach to understanding acid-base abnormalities in critical illness. *Journal of Pharmacy Practice*, 24 (1), 17-26.

Eiting, E. & Kim, H.T. Arterial puncture and cannulation. In Roberts, J.R., Custalow, C.B., Thomsen, T.W., et al, eds. *Roberts and Hedges' Clinical Procedures in Emergency Medicine and Acute Care*. 7th ed. Philadelphia: Elsevier; 2019. 377-93.

Ford, J. (2008). How to evaluate sharp safety-engineered devices. *Nursing Times*, 104(36), 42–45.

Galena, H. (1992). Complications occurring from diagnostic venepuncture. *Journal of Family Practice*, 34(5), 582–584.

Gilbert, H.C. & Vender, J. S. (1995). Arterial blood gas monitoring. *Critical Care Clinics*, 11(1), 233-48.

Hutin, Y., Hauri, A., Chiarello, L., Catlin, M., Stilwell, B., Ghebrehiwet, T., ... The Members of the Injection Safety Best Practices Development Group. (2003). Best infection control practices for intradermal, subcutaneous and intramuscular needle injections. *Bulletin of the World Health Organization*, 81(7), 491–500.

Kermode, M. (2004). Health worker safety is a prerequisite for injection safety in developing countries. *International Journal of Infectious Diseases*, 8, 325–327.

Lippi, G., Salvagno, G.L., Montagnana, M., Franchini, M. & Guidi, G.C. (2006). Phlebotomy issues and quality improvement in results of laboratory testing. *Clinical Laboratory*, 52, 217–230.

Little, M. A., Hussein, T., Lambert, M. & Dickson, S. J. (2007). Percutaneous blood sampling practice in a large urban hospital. *Clinical Medicine*, 7(3), 243–249.

National Audit Office. (2003). A safer place to work – improving the management of health and safety risks to staff in NHS trusts. London, NDA.

Lamontagne, F., Abiteboul, D., Lolom, I., Pellissier, G., Tarantola, A., Descamps, J.M. & Bouvet, E. (2007). Role of safety-engineered devices in preventing needlestick injuries in 32 French hospitals. *Infection Control and Hospital Epidemiology*, 28(1), 18–23.

Lavery, I. & Ingram, P. (2005). Blood sampling: best practice. *Nursing Standard*, 19, 55–65.

Leitch, A., McCormick, I., Gunn, I. & Gillespie, T. (2006). Reducing the potential for phlebotomy tourniquets to act as a reservoir for meticillin-resistant *Staphylococcus aureus*. *Journal of Hospital Infection*, 63(4), 428–431.

Liumbruno, G. M., Catalano, L., Piccinini, V., Pupella, S. & Grazzini, G. (2009). Reduction of the risk of bacterial contamination of blood components through diversion of the first part of the donation of blood and blood components. *Blood Transfusion*, 7(2), 86–93.

Moor, A.C., Dubbelman, T. M., VanSteveninck, J. & Brand, A. (1999). Transfusion-transmitted diseases: risks, prevention and perspectives. *European Journal of Haematology*, 62(1), 1–8.

National Committee for Clinical Laboratory Standards (2003). Procedures for the collection of diagnostic blood specimens by venipuncture. Approved standard, H3-A5. Wayne, PA: NCCLS

Newman, B. et al. (2007). The effect of a 473-ml (16-oz) water drink on vasovagal donor reaction rates in high school students. *Transfusion*, 47(8), 1524–1533.

NICE (2003). Infection control – prevention of healthcare-associated infections in primary and community care. London: National Institute for Health and Clinical Excellence. Retrieved from: <http://www.nice.org.uk/page.aspx?o=CG002fullguideline;>

Norberg, A. et al. (2003). Contamination rates of blood cultures obtained by dedicated phlebotomy vs intra venous catheter. *Journal of the American Medical Association*, 289(6):726–729.

Patout M., Lamia B., Lhuillier E., Molano L.C., Viacroze C., Benhamou D., et al. (2015). A Randomized Controlled Trial on the Effect of Needle Gauge on the Pain and Anxiety Experienced during Radial Arterial Puncture. *PLoS One*, 10 (9). e0139432.

Pratt R.J. et al. (2007) epic2: National evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. *Journal of Hospital Infection*, 65(Suppl 1):S1–S59.

- Pendergraph G. (1992). Handbook of phlebotomy. Philadelphia: Lea &Febiger. 3rd ed.
- Perry J. & Jagger J. (2003). EPINet data report: injuries from phlebotomy needles. *Advances in Exposure Prevention*, 6(4):43–45.
- Raffin T.A. (1986). Indications for arterial blood gas analysis. *Annals of Internal Medicine*, 105 (3):390-8.
- Rourke, C., Bates, C. & Read, R. (2001). Poor hospital infection control practice in blood sampling and use of tourniquets. *Journal of Hospital Infection*, 49(1), 59–61.
- Ruengsakulrach, P., Brooks, M., Hare, D.L., Gordon, I. & Buxton, B.F. (2001). Preoperative assessment of hand circulation by means of Doppler ultrasonography and the modified Allen test. *Journal of Thoracic and Cardiovascular Surgery*, 121 (3):526-31.
- Rutala, W., Weber, D., Committee HICPA (2008). Guidelines for disinfection and sterilization in healthcare facilities 2008. Atlanta, GA: Centers for Disease Control and Prevention. Retrieved from [http://www.cdc.gov/ncidod/dhapp/pdf/guidelines/Disinfection\\_nov\\_2008.pdf](http://www.cdc.gov/ncidod/dhapp/pdf/guidelines/Disinfection_nov_2008.pdf)
- Sacar, S. et al. (2006). Poor hospital infection control practice in hand hygiene, glove utilization, and usage of tourniquets. *American Journal of Infection Control*, 34(9):606–609.
- Sagy, M., Barzilay, Z. & Boichis, H. (1988). The diagnosis and management of acid-base imbalance. *Pediatric Emergency Care*, 4 (4):259-65.
- Scerbo, M. et al. (2006). The efficacy of a medical virtual reality simulator for training phlebotomy. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 48(1):72–84.
- Ter Haar, H. (2017). *Mechanische beademing op de intensive care*. Houten: Bohn Stafleu van Loghum. ISBN: 978-90-368-1589-5
- Wade, R.G., Crawford, J., Wade, D. & Holland, R. (2015). Radial artery blood gas sampling: a randomized controlled trial of lidocaine local anesthesia. *Journal of Evidence Based Medicine*, 8 (4), 185-91.
- Wagner, D. et al. (2004). Nosocomial acquisition of dengue. *Emerging Infectious Diseases*, 10(10), 1872–1873.
- Webster, J., Bell-Syer, S. & Foxlee, R. (2009). Skin preparation with alcohol versus alcohol followed by any antiseptic for preventing bacteraemia or contamination of blood for transfusion. *Cochrane Database of Systematic Reviews*, Issue 3. Art. No.: CD007948.

DOI:10.1002/14651858.CD007948. Retrieved from  
<http://mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD007948/frame.html>

WHO (2008). Guidelines on post exposure prophylaxis (PEP) to prevent human immunodeficiency virus (HIV) infection. Geneva, World Health Organization and International Labour Organization. Retrieved from  
<http://www.who.int/hiv/pub/guidelines/PEP/en/index.html>

WHO (2003). Guiding principles to ensure injection device security. Geneva, World Health Organization. Recuperado de: <http://apps.who.int/medicinedocs/en/d/Js4886e/>

WHO (2009). Guidelines on hand hygiene in healthcare. Geneva, World Health Organization. Retrieved from [http://whqlibdoc.who.int/publications/2009/9789241597906\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf)

WHO (2009). Blood transfusion safety. Geneva, World Health Organization. Retrieved from [http://www.who.int/bloodsafety/en/Blood\\_Transfusion\\_Safety.pdf](http://www.who.int/bloodsafety/en/Blood_Transfusion_Safety.pdf)

WHO (2009). 52 Basic requirements for blood transfusion services. Geneva: World Health Organization.

WHO (2007). Performance specification for sharps containers. Geneva: World Health Organization. Retrieved from  
[http://www.who.int/immunization\\_standards/vaccine\\_quality/who\\_pqs\\_e10\\_sb01.pdf](http://www.who.int/immunization_standards/vaccine_quality/who_pqs_e10_sb01.pdf);

WHO (2010). Guidelines on Drawing Blood: Best Practices in Phlebotomy. Geneva: World Health Organization. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK138665/>

Wilburn, S.E. & Eijkemans, G. (2004). Preventing needlestick injuries among healthcare workers: a WHO/ICN collaboration. *International Journal of Occupational and Environmental Health*, 2004, 10(4), 451–456.

Zimmerman, J.L. & Dellinger, R.P. (1996). Blood gas monitoring. *Critical Care Clinics*, 12 (4):865-74.

# Procedure in Nederlands: Arterieel Bloedgas

---

## 1. Definitie van de procedure

Arteriële bloedgas (ABG) afname is het aspireren van bloed uit een slagader, in eerste instantie om arteriële bloedgassen te bepalen. Het bloedstaal kan verkregen worden langs een katheter die geplaatst is in een slagader, of door de slagader te punteren met naald en spuit (WHO, 2010).

Deze spuiten zijn gehepariniseerd en behandeld om de blootstelling aan lucht te beperken aangezien dit de resultaten van de analyse zou kunnen beïnvloeden.

## 2. Therapeutische indicaties en contraïndicaties

De frequentste indicaties zijn: gezondheidsbeoordeling en beoordeling van het klinisch management.

Een ABG staal geeft waardevolle informatie over het zuur-base evenwicht op een bepaald tijdstip tijdens het ziekteproces. Het is de enige betrouwbare parameter op basis van CO<sub>2</sub> om te bepalen of de ventilatie succesvol is.

Het vormt een preciezere maatstaf voor succesvolle gasuitwisseling en oxygenatie en is de enige manier om de alveolair-arteriële zuurstofgradiënt nauwkeurig te bepalen.

\* Deze procedure mag alleen worden uitgevoerd door verpleegkundigen / artsen voor wie de procedure wettelijk gezien van toepassing is voor hun positie in hun land en die vaardigheid hebben aangetoond na een formele opleiding.

### **Contraïndicaties:**

Absolute contra-indicaties voor ABG afname zijn (Danckers, 2018):

- Abnormale gemodificeerde Allen-test (zie bijlage I), in dit geval moet worden overwogen om een punctie op een andere locatie uit te voeren
- Lokale infectie of vervormde anatomie ter hoogte van de potentiële punctieplaats (bijv. ten gevolge van eerdere chirurgische ingrepen, aangeboren of verworven misvormingen of brandwonden)
- De aanwezigheid van arterioveneuze fistels of vasculaire transplantaten, in welk geval een arteriële punctie niet mag worden uitgevoerd
- Bekende of vermoedelijke ernstige perifere vasculaire aandoening van de betreffende ledemaat



**Relatieve contra-indicaties waaronder (Danckers, 2018):**

- Ernstige coagulopathie
- Anticoagulatie therapie met warfarine, heparine en derivaten, directe trombine- of factor X-remmers (aspirine is in de meeste gevallen geen contra-indicatie voor staalname in een slagader)
- Gebruik van trombolytica, zoals streptokinase of weefselplasminogeenactivator

### 3. Materiaal

Leg alle onderstaande materialen op een veilige en goed bereikbare kar of dienblad, zodat je alles items duidelijk kan zien (WHO, 2010; NICE, 2003).

- Alle nodige proefbuisjes , droog en rechtopstaand verzameld in een rek. Het afgenomen bloedstaal kan verzameld worden in:
  - Steriele glazen of plasticen buisjes met rubber dop (de keuze is afhankelijk van de afspraken met het laboratorium);
  - Vacuum buisjes
  - Glazen buisjes met schroefdop
- Een steriel glas of bloedzak (opvouwbaar) indien grote hoeveelheden bloed moeten worden afgenomen;
- Goed passende, niet steriele handschoenen;
- Een assortiment materiaal voor bloedafname (veiligheidssystemen of naalden en spuitjes, zie onder), van verschillende maten;
- Handalcohol;
- 70% alcohol deppers voor ontsmetting van de huid;
- Kompressen om de punctieplaats af te dekken;
- Identificatielabels om aan te brengen op de buisjes;
- Schrijfgerei;
- Aanvraagformulier voor labo;
- Waterdichte transportzakjes en containers;
- Een naaldcontainer.

**Aanvullend materiaal:**

- Gehepariniseerde spuit;
- Naalden (20, 23 and 25 gauge, met verschillende lengte) – kies de maat, aangepast aan de aanprikplaats

- Een veiligheidsspuit met systeem waarbij de naald afgedekt wordt voor transport, zonder manueel te recappen.
- Een afdekkend verband om aan te brengen ter hoogte van de aanprikplaats na de bloedafname
- Een recipient met ijs om de bloedstalen te transporteren naar het laboratorium (indien de analyse niet plaatsvindt op de plaats van afname)
- Waar mogelijk, lokaal anestheticum en aanvullend een steriele wegwerpspuit en naald

#### 4. Stappenplan

Verschillende slagaders kunnen worden aangeprikt om een arterieel bloed af te nemen. De eerste keuze is de arteria radialis (omwille van de kleine diameter, vergt deze techniek uitgebreide vaardigheden in het afnemen van een arterieel bloedstaal).

Alternatieve aanprikplaatsen: arteria brachialis of femoralis, maar deze hebben verschillende nadelen zoals:

- Ze kunnen moeilijker gelokaliseerd worden (liggen minder oppervlakkig dan de arteria radialis);
- Ze hebben weinig collaterale circulatie;
- Ze zijn omringd door structuren die kunnen beschadigd geraken bij een foute techniek

\* Deze procedure beschrijft enkel de arteriële bloedafname via de arteria radialis. De arteria radialis begint ter hoogte van de bifurcatie van de arteria brachialis en loopt langs de radiale zijde van de voorarm naar de pols.

#### **Procedure:**

Zoals vermeld in de main guide WHO (2010) en de best-practice richtlijnen van NICE (2003)

- Benader de zorgvrager, stel jezelf voor en vraag de zorgvrager naar zijn de volledige naam.
- Positioneer de zorgvrager in platte ruglig. Vraag een tweede verpleegkundige om hulp wanneer de positie van de zorgvrager moet aangepast worden om het comfort te verhogen.
- Als de patiënt zijn vuisten balt, zijn adem inademt of huilt, kan dit de ademhaling veranderen en dus het testresultaat beïnvloeden.
- Bepaal de collaterale circulatie van de arteria radialis door de Allen-test uit te voeren (WHO, 2010). Als de eerste test geen collaterale circulatie aantoont herhaal deze test

aan de andere hand. Eens de ligging van de arteria radialis is bepaald, zoek je anatomische herkenningspunten zodat je de locatie terug kan vinden

- Voer handhygiëne uit, reinig het werkblad en bereid het materiaal voor. Trek een ondoordringbare schort en aangezichtsbescherming aan indien bloedcontact kan optreden.
- Ontsmet de aanprikplaats met 70% alcohol en laat dit opdrogen. Trek niet steriele handschoenen aan (indien het noodzakelijk is om de aanprikplaats herhaaldelijk aan te prikken, gebruik je steriele handschoenen).
- Als de naald nog niet op de spuit gemonteerd zit, plaats de naald op de heparinespuit en trek de stamper terug tot het vereiste vulniveau dat wordt aanbevolen door het plaatselijke laboratorium.
- Houd de spuit en de naald als een pijl vast, gebruik de wijsvinger om de aanprikplaats te lokaliseren, verwittig de zorgvrager dat je gaat prikken en breng de naald onder een hoek van 45° in, ongeveer 1 cm distaal (verwijderd van) van de wijsvinger om te voorkomen dat je de aanprikplaats contamineert.
- Trek de spuit en naald terug; laat de zorgvrager of de een assistent de aanprikplaats met een droog, proper kompres voldoende lang stevig afdrukken om de bloeding te stoppen. Controleer of de bloeding gestopt is na 2 tot 3 minuten. Voor zorgvragers met een hoge bloeddruk, stollingsstoornis of zorgvragers die anticoagulantia gebruiken kan 5 minuten afdrukken noodzakelijk zijn.
- Sluit de naald af door gebruik van het veiligheidssysteem vooraleer je de spuit in de ijsemmer plaatst. Wanneer je geen gebruik maakt van een veiligheidssysteem, gebruik je de een-hand-techniek om het omhulsel over de naald te scheppen na het verwijderen van de naald.
- Verwijder luchtbellens, sluit de spuit af en rol het staal zachtjes tussen de handen om het staat te mengen. Sluit de spuit af om te voorkomen dat het arterieel bloed in contact komt met de lucht en te voorkomen dat de spuit lekt tijdens het transport naar het laboratorium.
- Kleef een label op het bloedstaal.
- Verwijder alle materiaal en persoonlijke beschermingsmiddelen op gepaste wijze.
- Trek de handschoenen uit en was de handen met water en zeep en dep de handen droog met een wegwerphanddoekje indien deze zichtbaar bevuild zijn of ontsmet de handen met handalcohol.

- Controleer de aanprikplaats op bloeding (indien nodig breng je een extra drukverband aan) en bedank de zorgvrager.
- Breng het bloedstaal onmiddellijk naar het laboratorium, respecteer hierbij de richtlijnen van het laboratorium.

## 5. Potentiële complicaties en aspecten waarmee rekening dient gehouden te worden

Mogelijke complicaties van ABG staalafname zijn (Danckers, 2018; Eiting et al.; 2019; WHO, 2010):

- Arterieel vaatspasme
- Arteriële occlusie
- Luchtembool of thrombo-embolie
- Hemorragie
- Anafylactische reactie ten gevolge van lokaal anestheticum
- Infectie van de aanprikplaats
- Lokaal hematoom
- Lokale pijn
- Prinkongeval bij de zorgverlener
- Zenuw schade
- Dissectie van het bloedvat
- Vaso-vagale reactie

Andere problemen kunnen zijn: bloeddrukval, syncopale klachten zweten, bleek zien die kunnen voorafgaan aan bewustzijnsverlies (WHO, 2010; AARC, 1992).

### **FOUTEN BIJ STAALAFNAME:**

Fouten bij het afnemen of behandelen van het arteriële bloedstaal kan aanleiding geven tot foute resultaten. Oorzaken van een fout bloedresultaat kunnen zijn (WHO,2010; Larkin et al. 2015).

- Aanwezigheid van lucht in het staal;
- Afname van veneus bloed in plaats van arterieel bloed;
- Een foute dosis heparine in de spuit of onvoldoende mengen van het bloedstaan na afname;
- Vertraagd transport van het staal.

## Referenties

American Association for Respiratory Care. AARC clinical practice guideline. (1992) Sampling for arterial blood gas analysis. *Respiratory Care*, 8(37), 891–897.

Asif, M. & Sarkar, P. K. (2007). Three-digit Allen's test. *Annals of Thoracic Surgery*, 84 (2), 686-7.

Barker, L. (2008). Venipuncture syncope – one occupational health clinic's experience. *Journal of the American Association of Occupational Health Nurses*, 56(4), 139–140.

Barone, J.E. & Madlinger, R. V. (2006). Should an Allen test be performed before radial artery cannulation? *Journal of Trauma*, 61(2), 468-70.

Baillie, J.K. (2008). Simple, easily memorised "rules of thumb" for the rapid assessment of physiological compensation for respiratory acid-base disorders. *Thorax*, 63(3), 289-90.

Bobbia, X., Grandpierre, R.G., Claret, P.G., Moreau, A., Pommet, S., Bonnet, J.M., ... de La Coussaye, J. E. (2013). Ultrasound guidance for radial arterial puncture: a randomized controlled trial. *American Journal of Emergency Medicine*, 31(5), 810-5.

Brzezinski, M., Luisetti, T. & London, M. J. (2009). Radial artery cannulation: a comprehensive review of recent anatomic and physiologic investigations. *Anesthesia & Analgesia*, 109 (6), 1763-81.

Calfee, D. & Farr, B. (2002). Comparison of four antiseptic preparations for skin in the prevention of contamination of percutaneously drawn blood cultures: a randomized trial. *Journal of Clinical Microbiology*, 40(5), 1660–1665.

Castellaa, A., Vallinoa, A., Argenterob, P. A. & Zottia, C. M. (2003). Preventability of percutaneous injuries in healthcare personnel: a year-long survey in Italy. *Journal of Hospital Infection*, 55(4), 290–294.

Centers for Disease Control and Prevention. (1997). Evaluation of safety devices for preventing percutaneous injuries among health-care personnel during phlebotomy procedures 1993–1995. *Morbidity and Mortality Weekly Report*, 46(2), 21–25. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/00045648.htm>

So you're going to collect a blood specimen: an introduction to phlebotomy, 12th ed. (2007). USA: College of American Pathologists.

Cullen, B., Genasi, F., Symington, I., Bagg, J., McCreddie, M., Taylor, A., ... Goldberg, D.J. (2006). Potential for reported needlestick injury prevention among healthcare personnel through safety

device usage and improvement of guideline adherence: expert panel assessment. *Journal of Hospital Infection*, 63(4), 445–451.

Davis, M., Walsh, B., Sittig, S. & Restrepo, R. (2013). AARC clinical practice guideline: blood gas analysis and hemoximetry: 2013. *Respiratory Care*, 58(10), 1694-703.

Danckers, M. (2018). Arterial Blood Gas Sampling. Medscape. <https://emedicine.medscape.com/article/1902703-print>. Updated: Aug 15, 2018.

de Vries, J., van Dorp, W. & van Barneveld, P. (1997). A randomized control trial of alcohol 70% versus alcoholic iodine 2% in skin disinfection before insertion of peripheral infusion catheters. *Journal of Hospital Infection*, 36(4), 317–320.

Dzierba, A. L. & Abraham, P. (2011). A practical approach to understanding acid-base abnormalities in critical illness. *Journal of Pharmacy Practice*, 24 (1), 17-26.

Eiting, E. & Kim, H.T. Arterial puncture and cannulation. In Roberts, J.R., Custalow, C.B., Thomsen, T.W., et al, eds. *Roberts and Hedges' Clinical Procedures in Emergency Medicine and Acute Care*. 7th ed. Philadelphia: Elsevier; 2019. 377-93.

Ford, J. (2008). How to evaluate sharp safety-engineered devices. *Nursing Times*, 104(36), 42–45.

Galena, H. (1992). Complications occurring from diagnostic venepuncture. *Journal of Family Practice*, 34(5), 582–584.

Gilbert, H.C. & Vender, J. S. (1995). Arterial blood gas monitoring. *Critical Care Clinics*, 11(1), 233-48.

Hutin, Y., Hauri, A., Chiarello, L., Catlin, M., Stilwell, B., Ghebrehiwet, T., ... The Members of the Injection Safety Best Practices Development Group. (2003). Best infection control practices for intradermal, subcutaneous and intramuscular needle injections. *Bulletin of the World Health Organization*, 81(7), 491–500.

Kermode, M. (2004). Health worker safety is a prerequisite for injection safety in developing countries. *International Journal of Infectious Diseases*, 8, 325–327.

Lippi, G., Salvagno, G.L., Montagnana, M., Franchini, M. & Guidi, G.C. (2006). Phlebotomy issues and quality improvement in results of laboratory testing. *Clinical Laboratory*, 52, 217–230.

Little, M. A., Hussein, T., Lambert, M. & Dickson, S. J. (2007). Percutaneous blood sampling practice in a large urban hospital. *Clinical Medicine*, 7(3), 243–249.

National Audit Office. (2003). A safer place to work – improving the management of health and safety risks to staff in NHS trusts. London, NDA.

Lamontagne, F., Abiteboul, D., Lolom, I., Pellissier, G., Tarantola, A., Descamps, J.M. & Bouvet, E. (2007). Role of safety-engineered devices in preventing needlestick injuries in 32 French hospitals. *Infection Control and Hospital Epidemiology*, 28(1), 18–23.

Lavery, I. & Ingram, P. (2005). Blood sampling: best practice. *Nursing Standard*, 19, 55–65.

Leitch, A., McCormick, I., Gunn, I. & Gillespie, T. (2006). Reducing the potential for phlebotomy tourniquets to act as a reservoir for meticillin-resistant *Staphylococcus aureus*. *Journal of Hospital Infection*, 63(4), 428–431.

Liumbruno, G. M., Catalano, L., Piccinini, V., Pupella, S. & Grazzini, G. (2009). Reduction of the risk of bacterial contamination of blood components through diversion of the first part of the donation of blood and blood components. *Blood Transfusion*, 7(2), 86–93.

Moor, A.C., Dubbelman, T. M., VanSteveninck, J. & Brand, A. (1999). Transfusion-transmitted diseases: risks, prevention and perspectives. *European Journal of Haematology*, 62(1), 1–8.

National Committee for Clinical Laboratory Standards (2003). Procedures for the collection of diagnostic blood specimens by venipuncture. Approved standard, H3-A5. Wayne, PA: NCCLS

Newman, B. et al. (2007). The effect of a 473-ml (16-oz) water drink on vasovagal donor reaction rates in high school students. *Transfusion*, 47(8), 1524–1533.

NICE (2003). Infection control – prevention of healthcare-associated infections in primary and community care. London: National Institute for Health and Clinical Excellence. Retrieved from: <http://www.nice.org.uk/page.aspx?o=CG002fullguideline;>

Norberg, A. et al. (2003). Contamination rates of blood cultures obtained by dedicated phlebotomy vs intra venous catheter. *Journal of the American Medical Association*, 289(6):726–729.

Patout M., Lamia B., Lhuillier E., Molano L.C., Viacroze C., Benhamou D., et al. (2015). A Randomized Controlled Trial on the Effect of Needle Gauge on the Pain and Anxiety Experienced during Radial Arterial Puncture. *PLoS One*, 10 (9). e0139432.

Pratt R.J. et al. (2007) epic2: National evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. *Journal of Hospital Infection*, 65(Suppl 1):S1–S59.

- Pendergraph G. (1992). Handbook of phlebotomy. Philadelphia: Lea &Febiger. 3rd ed.
- Perry J. & Jagger J. (2003). EPINet data report: injuries from phlebotomy needles. *Advances in Exposure Prevention*, 6(4):43–45.
- Raffin T.A. (1986). Indications for arterial blood gas analysis. *Annals of Internal Medicine*, 105 (3):390-8.
- Rourke, C., Bates, C. & Read, R. (2001). Poor hospital infection control practice in blood sampling and use of tourniquets. *Journal of Hospital Infection*, 49(1), 59–61.
- Ruengsakulrach, P., Brooks, M., Hare, D.L., Gordon, I. & Buxton, B.F. (2001). Preoperative assessment of hand circulation by means of Doppler ultrasonography and the modified Allen test. *Journal of Thoracic and Cardiovascular Surgery*, 121 (3):526-31.
- Rutala, W., Weber, D., Committee HICPA (2008). Guidelines for disinfection and sterilization in healthcare facilities 2008. Atlanta, GA: Centers for Disease Control and Prevention. Retrieved from [http://www.cdc.gov/ncidod/dhap/pdf/guidelines/Disinfection\\_nov\\_2008.pdf](http://www.cdc.gov/ncidod/dhap/pdf/guidelines/Disinfection_nov_2008.pdf)
- Sacar, S. et al. (2006). Poor hospital infection control practice in hand hygiene, glove utilization, and usage of tourniquets. *American Journal of Infection Control*, 34(9):606–609.
- Sagy, M., Barzilay, Z. & Boichis, H. (1988). The diagnosis and management of acid-base imbalance. *Pediatric Emergency Care*, 4 (4):259-65.
- Scerbo, M. et al. (2006). The efficacy of a medical virtual reality simulator for training phlebotomy. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 48(1):72–84.
- Ter Haar, H. (2017). *Mechanische beademing op de intensive care*. Houten: Bohn Stafleu van Loghum. ISBN: 978-90-368-1589-5
- Wade, R.G., Crawford, J., Wade, D. & Holland, R. (2015). Radial artery blood gas sampling: a randomized controlled trial of lidocaine local anesthesia. *Journal of Evidence Based Medicine*, 8 (4), 185-91.
- Wagner, D. et al. (2004). Nosocomial acquisition of dengue. *Emerging Infectious Diseases*, 10(10), 1872–1873.
- Webster, J., Bell-Syer, S. & Foxlee, R. (2009). Skin preparation with alcohol versus alcohol followed by any antiseptic for preventing bacteraemia or contamination of blood for transfusion. *Cochrane Database of Systematic Reviews*, Issue 3. Art. No.: CD007948.



DOI:10.1002/14651858.CD007948. Retrieved from  
<http://mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD007948/frame.html>

WHO (2008). Guidelines on post exposure prophylaxis (PEP) to prevent human immunodeficiency virus (HIV) infection. Geneva, World Health Organization and International Labour Organization. Retrieved from  
<http://www.who.int/hiv/pub/guidelines/PEP/en/index.html>

WHO (2003). Guiding principles to ensure injection device security. Geneva, World Health Organization. Recuperado de: <http://apps.who.int/medicinedocs/en/d/Js4886e/>

WHO (2009). Guidelines on hand hygiene in healthcare. Geneva, World Health Organization. Retrieved from [http://whqlibdoc.who.int/publications/2009/9789241597906\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf)

WHO (2009). Blood transfusion safety. Geneva, World Health Organization. Retrieved from [http://www.who.int/bloodsafety/en/Blood\\_Transfusion\\_Safety.pdf](http://www.who.int/bloodsafety/en/Blood_Transfusion_Safety.pdf)

WHO (2009). 52 Basic requirements for blood transfusion services. Geneva: World Health Organization.

WHO (2007). Performance specification for sharps containers. Geneva: World Health Organization. Retrieved from  
[http://www.who.int/immunization\\_standards/vaccine\\_quality/who\\_pqs\\_e10\\_sb01.pdf](http://www.who.int/immunization_standards/vaccine_quality/who_pqs_e10_sb01.pdf);

WHO (2010). Guidelines on Drawing Blood: Best Practices in Phlebotomy. Geneva: World Health Organization. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK138665/>

Wilburn, S.E. & Eijkemans, G. (2004). Preventing needlestick injuries among healthcare workers: a WHO/ICN collaboration. *International Journal of Occupational and Environmental Health*, 2004, 10(4), 451–456.

Zimmerman, J.L. & Dellinger, R.P. (1996). Blood gas monitoring. *Critical Care Clinics*, 12 (4):865-74.

# CHAPTER 4

## Intramuscular Injection

---

*Nelia Soto-Ruiz, Tomás Ballesteros-Egüés, Paula Escalada-Hernández & Leticia San Martín-Rodríguez*

# Procedure in English: Intramuscular Injection

---

## 1. Definition of the procedure

Intramuscular injection technique (IM) involves inserting a needle into a muscle to administer a drug or medicine into the deep intramuscular tissue.

## 2. Therapeutic indications and Contraindications

- IM is the chosen route when the patient's disease or the drug properties exclude oral treatment
- This technique is easier and less risky than intravenous routes
- It allows a broader range of pharmaceutical preparations to be administered plus higher volumes than subcutaneous administration and all as effectively as the intravenous method
- After intravenous routes, the parenteral route has the next fastest absorption rate. Vascularization of muscle tissue causes rapid drug absorption within 10/30 minutes unlike subcutaneous administration that requires more than 30 minutes for absorption
- IM is preferred over other administration routes for medication that causes irritation

### Contraindications:

Related to the drug, following sites should be avoided: damaged skin area, sensitivity or induration, hematomas and areas of infection or areas that are difficult to access or inhibit the mobility of the patient (Rodger & King, 2000).

## 3. Materials

- Medication administration sheet or computer printout (doctor's orders)
- Syringe tray or trolley
- Syringe with 2 -3 ml for adults or 0.5 ml for children or babies
- 18-21G, 25 mm needles for loading and 21G, 40 mm needle for intramuscular administration. The needle length should be at least 5 cm for obese patients
- Gauze and / or swab with alcohol or disinfectant (70% alcohol). –Avoid use of cotton wool due to the risk of letting particles enter when making the puncture
- The ampoule or vial of medication
- Sharps disposal container, dirty bag and a hansaplast plaster (not in Spain)

## 4. Stages of the procedure

There are five IM injection areas (Rodger & King, 2000): deltoids, dorsogluteal, rectus femoris, vastus lateralis, and ventrogluteal areas. This document covers the two-gluteal areas: Dorsogluteal and ventrogluteal areas.

### Stages of the procedure:

- Explain the procedure to the patient and provide the necessary information about the medication that will be administered
- Draw the curtains or close the door
- Wash your hands
- Keep the sheet or the clothing covering body parts that do not need to be exposed
- Help patient into an appropriate posture:
  - Option 1 (ventrogluteal area): lateral or supine position with the injection-side knee and hip side bent and femur slightly rotated inwards, to minimise pain (Rodger & King, 2000)
  - Option 2 (dorsogluteal area): patient prone, feet turned inwards or on side with bent knees and hips
- Locate the area using the anatomical points. There are two location techniques (Rodger & King, 2000):
  - Option 1 (dorsogluteal area): Divide the gluteus into 4 quadrants and select the upper outer quadrant (Rodger & King, 2000), about 5-8 cm below the iliac crest
  - Option 2 (dorsogluteal area): Palpation iliac spine and the greater trochanter; draw an imaginary line connecting the two points, determine the midpoint of that line and the puncture site will be located above and out from that point (Rodger & King, 2000). The path of the sciatic nerve lies parallel to and below this line
  - Option 3 (ventrogluteal area): Place your palm over the greater trochanter of the hip. Point your thumb towards the groin and your fingers towards the head along the iliac spine. Your index and middle fingers and the iliac crest form an inverted triangle. The injection zone lies in the centre of this triangle
- Select the appropriate injection zone by assessing the size and muscle integrity, if there is any damaged skin area, accessibility and mobility (Rodger & King, 2000). Palpate the area to rule out areas of sensitivity or induration and assess any hematomas or areas of infection

- Clean the area with a cotton swab and antiseptic. Apply the swab to the centre of the area and make rotating movements outwards (approximately 5 cm). The disinfectant should be in contact with the skin for at least 30 seconds to actually disinfect and prevent pain and irritation by pushing in the needle when the antiseptic has not dried (Hunter, 2008). Some authors suggest that if a patient's skin is not dirty and if the nurse has washed his/her hands and takes sterile measures during the procedure, it is not necessary to disinfect the area (Hunter, 2008 and Ogston-Tuck, 2014)
- Remove the cap from the needle, hold the syringe between your thumb and index finger like a dart, holding it at a 90° angle with your palm facing down
- Administer the injection: Inject the needle quickly into the muscle at an angle of 90 degrees (if the patient's muscle mass is low, pinch the body). The needle should penetrate the skin quickly to avoid further patient discomfort (Ogston Tuck, 2014)
- After the needle has punctured the area, hold the lower terminal end of the syringe barrel with your non-dominant hand to steady the syringe
- Avoid moving the syringe. Slowly pull the syringe plunger out; if no blood appears, inject medication slowly, at a rate of 1 ml / about 10 seconds (Hunter, 2008 and Ogston Tuck-S, 2014). It should not suck when intramuscular injection is intended to administer a vaccine (General Recommendations on Immunisation. Recommendations from the Advisory Committee on Immunisation Practices. Recommendations and Report, 2006) and when using the ventrogluteal area
- Wait 10 seconds and then remove the needle gently but firmly, while applying light pressure with a cotton swab with antiseptic on the puncture:
  - Option 1: Do not massage the area as this can cause irritation by filtration of the medication through the inlet port (Martínez-Espejo Sánchez & Armero Barranco, 2007 and Hunter, 2008).
  - Option 2: give a light massage in the area for a few seconds (Martínez-Espejo Sánchez & Armero Barranco, 2007 and Hunter, 2008).
- Discard the needle, activating the security system, and put it in the special sharps container and put a hansaplast (not in Spain)
- Throw away the rest of the material used (select trash for the appropriate container) and wash your hands
- Assess the effectiveness of the medication 15 to 20 min after administration (in analgesics, antiemetic drugs, etc.)
- Assess the puncture site 2-4 hours after injection for signs of local irritation

- In ventrogluteal areas and in the vastus lateralis, perform leg exercises

## 5. Potential complications and/or aspects to take into account

Potential complications of any IM injection are pain, contractures, paralysis, peripheral nerve injury, local irritation, pain, infection, neuropathies, bruising, bleeding, persistent nodules, arterial puncture, fibrosis, abscess, tissue necrosis, gangrene and muscle contractions (Rodger & King, 2000). It should also be noted that constantly administering in one area might cause local fibrosis, which causes a progressive reduction of absorption.

### Considerations regarding the anatomical structures related to puncture:

#### Gluteus/ventrogluteal muscle

- Numerous authors consider the gluteus as the area of choice for IM (Brown, Guillespie & Chad, 2015 and Ogston Tuck, 2014)
- The use of this area reduces the risk associated with IM (Rodger & King, 2000) injection injury
- There is no danger of puncturing the sciatic nerve or large vessels and the fat layer is much thinner than in the dorsogluteal area. (Martínez-Espejo Sánchez & Armero Barranco, 2007 and Tuck, 2014)
- Some authors suggest that it is not a suitable place on children under 3 years old (Rodger & King, 2000)
- Some authors suggest that it is the site of choice on immobilised patients, since they often have an atrophied gluteus maximus (Rodger & King, 2000)

#### Dorsogluteal area (gluteus maximus)

- There is a risk of touching the sciatic nerve. This might cause permanent or temporary paralysis of the affected leg
- There is a risk of reaching the major blood vessels (artery and sciatic veins), and puncturing them (Brown, Guillespie & Chad, 2015)
- The existence of a large amount of adipose tissue, in addition to the proximity of nerves and major blood vessels, makes this site problematic (Rodger & King, 2000)
- Injections should not be given in this area while the patient is standing (Rodger & King, 2000)
- Not recommended for children under 10 years old (Brown, Guillespie & Chad, 2015)

## References

Brown, J., Gillespie, M. & Chard, S. (2015). The dorso–ventro debate: in search of empirical evidence. *British Journal of Nursing*, 24 (22), 1132-1139.

Hunter, J. (2008). Intramuscular injection techniques. *Nursing Standard*, 22 (24), 35-40.

Martínez-Espejo Sánchez, M. D., & Armero Barranco, D. (2007). *Procedimientos clínicos en enfermería del adulto* (2ª Ed). Murcia: Librero-Editor.

Ogston-Tuck, S. (2014). Intramuscular injection technique: an evidence-based approach. *Nursing Standard*, 29 (4), 52-59.

Perry, A. G., & Potter, P. A. (1999). *Enfermería clínica: Técnicas y Procedimientos* (4ª Ed). St.Louis: Harcourt - Mosby

Rodger, M. & King, L. (2000). Drawing up and administering intramuscular injections: A review of a literature. *Journal of Advanced Nursing*, 31 (3), 574-582.

# Procedure in Spanish: Inyección Intramuscular

---

## 1. Definición del procedimiento

La inyección intramuscular (IM) supone la inserción de una aguja en un músculo, con el objetivo de administrar un fármaco o medicamento en el tejido intramuscular profundo.

## 2. Indicaciones terapéuticas y contraindicaciones

- La vía IM es la vía más usada cuando la enfermedad del paciente o las propiedades del medicamento contraindican el tratamiento oral
- Es más sencilla y menos arriesgada que la vía intravenosa
- Permite la administración de un abanico más amplio de preparaciones medicamentosas además de volúmenes mayores que en la administración por vía subcutánea, y siendo igual de eficaz que la vía intravenosa
- Después de la vía intravenosa es la vía parenteral con mayor velocidad de absorción. La vascularización del tejido muscular produce una rápida absorción del fármaco entre 10/30 minutos a diferencia de la administración subcutánea que requiere más de 30 minutos para la absorción
- La vía IM es preferible a otras vías de administración cuando las medicaciones son irritantes

### **Contraindicaciones:**

En relación con el medicamento se deben evitar los siguientes sitios: área dañada de la piel, sensibilidad o induración, hematomas y áreas de infección, o áreas de difícil acceso o que inhiben la movilidad del paciente (Rodger & King, 2000).

## 3. Materiales

- Hoja de administración de la medicación o listado por ordenador (orden médica)
- Batea o carro
- Jeringa de 5 ml para adultos ó 2 ml para niños o bebés
- Aguja del calibre entre 18 y 21G y 25 mm para cargar, y aguja de 21 G y hasta de 40 mm para la administración intramuscular. En caso de pacientes que presenten obesidad la longitud de la aguja deberá ser de al menos 5 cm
- Gasa con alcohol o desinfectante (alcohol al 70%). Evitar la utilización de algodón por el riesgo de introducir partículas en el momento de la punción



- Ampolla o vial de medicación
- Guantes desechables
- Contenedor para desechar objetos punzantes y bolsa sucia

#### 4. Pasos del procedimiento

Existen cinco zonas para la inyección IM (Rodger & King, 2000): zona del deltoides, zona dorsoglútea, zona del recto femoral, zona del vasto lateral y zona ventroglútea. En este documento se abordan las dos zonas glúteas: dorsoglútea y ventroglútea.

##### **Pasos del procedimiento:**

- Explique al paciente el procedimiento y proporcione la información necesaria sobre la medicación a administrar
- Cierre las cortinas y/o cierre la puerta de la habitación para mantener la intimidad del paciente.
- Lávese las manos
- Mantenga la sábana o la ropa sobre las partes del cuerpo que no requieren exposición
- Ayude al paciente a adoptar una postura cómoda:
  - Opción 1 (zona ventroglútea): decúbito lateral o supino con la rodilla y la cadera del lado de la inyección flexionadas y con el fémur ligeramente rotado hacia el interior, para minimizar el dolor (Rodger & King, 2000)
  - Opción 2 (zona dorsoglútea): paciente en decúbito prono, con los pies girados hacia dentro o en decúbito lateral con las rodillas y la cadera flexionadas
- Localice la zona utilizando los puntos anatómicos. Existen dos técnicas de localización (Rodger & King, 2000):
  - Opción 1 (zona dorsoglútea): División del glúteo en 4 cuadrantes y selección del cuadrante superior externo (Rodger & King, 2000), aproximadamente a 5-8cm por debajo de la cresta ilíaca
  - Opción 2 (zona dorsoglútea): Palpación la espina ilíaca y el trocánter mayor del fémur; trazar una línea imaginaria que una ambos puntos, determinar el punto medio de esa línea, y el punto de punción se localizará por encima y hacia fuera de ese punto (Rodger & King, 2000). El trayecto del nervio ciático es paralelo e inferior a esta línea
  - Opción 3 (zona ventroglútea): Coloque la palma de la mano sobre el trocánter mayor de la cadera. Se orienta el pulgar hacia la ingle y el resto de los dedos, hacia la cabeza apuntando hacia la espina ilíaca. Los dedos índice y medio y la

cresta ilíaca forman un triángulo invertido. La zona de inyección se sitúa en el centro de este triángulo

- Seleccione la zona adecuada para la inyección valorando el tamaño y la integridad muscular, si existe alguna zona de piel dañada, la accesibilidad y la movilidad (Rodger & King, 2000). Palpe la zona para descartar áreas de sensibilidad o induración y valore la existencia de hematomas o áreas de infección.
- Limpie la zona con una gasa y con antiséptico. Coloque la gasa en el centro de la zona y realice un movimiento de rotación hacia afuera (5 cm aproximadamente). El desinfectante deberá estar en contacto con la piel durante al menos 30 segundos, para que realice su función de desinfección y para evitar dolor e irritación al penetrar la aguja con el antiséptico sin secar (Hunter, 2008)

Algunos autores sugieren que si la piel del paciente no está sucia y si la enfermera se ha lavado las manos y mantiene las medidas de asepsia durante el procedimiento, no es necesario desinfectar la zona (Hunter, 2008 y Ogston-Tuck S, 2014)

- Quite el capuchón de la aguja, sujete la jeringa entre el dedo pulgar y el índice como si fuera un dardo y manténgala en un ángulo de 90° con la palma de la mano hacia abajo.
- Administre la inyección: inyecta la aguja rápidamente en el músculo con un ángulo de 90 grados (si la masa muscular del paciente es escasa pellizque el cuerpo). La aguja debe penetrar en la piel rápidamente para evitar mayor incomodidad en el paciente (Ogston-Tuck S, 2014)
- Después de que la aguja haya puncionado la zona sujete el extremo terminal inferior del cilindro de la jeringa con la mano no dominante para estabilizar la jeringa
- Evite movilizar la jeringa. Tire lentamente del émbolo de la jeringa hacia afuera, si no aparece sangre, inyecte la medicación lentamente, a una velocidad de 1 ml / 10 segundos aproximadamente (Hunter, 2008 y Ogston-Tuck S, 2014). No se deberá aspirar cuando la inyección intramuscular sea para administrar una vacuna (General Recommendations on Immunization. Recommendations of the Advisory Committee on Immunization Practices. Recommendations and Report, 2006), ni cuando se utilice la zona ventroglútea
- Espere 10 segundos y, a continuación, retire la aguja con suavidad, pero con firmeza, mientras aplica una ligera presión con una gasa con antiséptico sobre la zona de punción:

- Opción 1: No masajear la zona ya que puede producir irritación por filtración de la medicación a través del orificio de entrada (Martínez-Espejo Sánchez & Armero Barranco, 2007 y Hunter, 2008).
- Opción 2: Dar un ligero masaje en la zona durante unos pocos segundos (Martínez-Espejo Sánchez & Armero Barranco, 2007 y Hunter, 2008).
- Deseche la aguja activando el sistema de seguridad, en el contenedor especial para objetos punzantes
- Deseche el resto del material utilizado (jeringa, guantes) a la basura y lávese las manos.
- Valore la efectividad de la medicación 15-20 minutos después de la administración (en analgésicos, medicación antiemética, etc.)
- Valore la zona de punción a las 2-4 horas de la inyección en busca de signos de irritación local
- En las zonas ventroglúteas y en el vasto externo estimule la realización de ejercicios de las piernas

## 5. Complicaciones potenciales y/o aspectos a considerar

Las complicaciones potenciales de cualquier inyección IM son: dolor, contracturas, parálisis, lesión de nervios periféricos, irritación local, infección, neuropatías, hematomas, sangrado, nódulos persistentes, punción arterial, fibrosis, absceso, necrosis de tejidos, gangrena y contracción del músculo (Rodger & King, 2000). Además, hay que tener en cuenta que la administración constante en una misma zona puede ocasionar fibrosis local, lo que produce una reducción progresiva de la absorción.

### Consideraciones a tener en cuenta relacionadas con las estructuras anatómicas de punción:

#### Músculo glúteo/ventroglútea

- Numerosos autores la consideran como la zona de elección para la inyección IM en el glúteo (Brown, Guillespie & Chad, 2015 y Ogston-Tuck S, 2014)
- El uso de esta zona reduce el riesgo de lesiones asociadas a la inyección IM (Rodger & King, 2000)
- No existe el peligro de puncionar el nervio ciático, ni grandes vasos y la capa grasa en mucho más fina que en la zona dorso-glútea (Martínez-Espejo Sánchez & Armero Barranco, 2007 y Ogston-Tuck S, 2014)
- Algunos autores sugieren que no es un sitio adecuado para niños menores de 3 años (Rodger & King, 2000)

- Algunos autores sugieren que es el sitio de elección en pacientes inmovilizados, ya que suelen tener el glúteo mayor atrofiado (Rodger & King, 2000)

#### Zona dorsoglútea (glúteo mayor)

- Existe el riesgo de alcanzar el nervio ciático, lo puede producir una parálisis permanente o transitoria de la pierna afectada
- Existe el riesgo de alcanzar los vasos sanguíneos principales (arteria y venas ciáticas), pudiendo llegar a romperlos con la punción (Brown, Gillespie & Chad, 2015)
- La existencia en la zona de gran cantidad de tejido adiposo además de la proximidad de nervios y vasos sanguíneos principales, hacen que este sitio sea problemático (Rodger & King, 2000)
- Las inyecciones no deben administrarse en esta zona mientras el paciente se encuentra de pie (Rodger & King, 2000)
- No es recomendable en niños menores de 10 años (Brown, Gillespie & Chad, 2015)

## Referencias

Brown, J., Gillespie, M. & Chard, S. (2015). The dorso–ventro debate: in search of empirical evidence. *British Journal of Nursing*, 24 (22), 1132-1139.

Hunter, J. (2008). Intramuscular injection techniques. *Nursing Standard*, 22 (24), 35-40.

Martínez-Espejo Sánchez, M. D., & Armero Barranco, D. (2007). *Procedimientos clínicos en enfermería del adulto (2ª Ed)*. Murcia: Librero-Editor.

Ogston-Tuck, S. (2014). Intramuscular injection technique: an evidence-based approach. *Nursing Standard*, 29 (4), 52-59.

Perry, A. G., & Potter, P. A. (1999). *Enfermería clínica: Técnicas y Procedimientos (4ª Ed)*. St.Louis: Harcourt – Mosby.

Rodger, M. & King, L. (2000). Drawing up and administering intramuscular injections: A review of a literature. *Journal of Advanced Nursing*, 31 (3), 574-582.

# Procedure in Portuguese: Injeção Intramuscular

---

## 1. Definição do procedimento

A técnica de injeção intramuscular envolve a inserção de uma agulha num músculo para administrar uma droga ou medicamento no tecido intramuscular profundo.

## 2. Indicações terapêuticas e contraindicações

- A injeção intramuscular é a via escolhida quando pelas características do doente ou pelas propriedades do fármaco não pode ser administrado por oral
- Esta técnica é mais fácil e com menos risco do que a via intravenosa
- Permite a administração de uma gama mais ampla de preparações farmacêuticas, além de maiores volumes, do que a administração subcutânea, e é igualmente eficaz como a via intravenosa
- Depois da via intravenosa, a parenteral tem a segunda maior rapidez de absorção. A vascularização do tecido muscular provoca uma rápida absorção do fármaco em 10/30 minutos, ao contrário da administração subcutânea que demora mais do que 30 minutos para a absorção
- A injeção intramuscular é preferida em relação a outras vias de administração de medicação que causam irritação

### **Contraindicações:**

Tendo em consideração os diferentes fármacos, os seguintes locais devem ser evitados: pele danificada, sensibilidade ou tumefação, hematomas e áreas de infeção ou áreas de difícil acesso ou que limitem a mobilidade do doente (Rodger & King, 2000).

## 3. Materiais

- Folheto de administração de medicamentos ou cópia impressa (prescrição médica)
- Bandeja de seringa ou carrinho
- Seringa com 2-3 ml para adultos ou 0,5 ml para crianças ou bebés
- Agulhas de 18-21 G e 25 mm para encher a seringa e agulhas 21G e 40mm para administração intramuscular. O comprimento da agulha deve ser de pelo menos 5 cm para doentes obesos
- Gaze e/ou compressa com álcool ou desinfetante (70% de álcool). - Evitar o uso de algodão devido ao risco de deixar entrar partículas ao fazer a punção

- Ampola ou frasco de medicação
- Recipiente para descarte de objetos cortos perfurantes, um saco do lixo e um penso rápido

#### 4. Fases do procedimento

Existem 5 áreas para injeção intramuscular (Rodger & King, 2000): deltoide, dorsoglútea, reto femoral, vasto lateral e ventro glútea. Este documento abrange as duas áreas glúteas: dorsoglútea e ventro glútea.

##### **Etapas do procedimento:**

- Explique o procedimento ao paciente e forneça as informações necessárias sobre a medicação que será administrada
- Corra as cortinas ou feche a porta
- Lave as mãos
- Mantenha o lençol ou a roupa que cobre as partes do corpo que não precisam de ser expostas
- Ajude o doente a adotar uma postura adequada:
  - Opção 1 (área ventro glútea): decúbito dorsal ou lateral, com o joelho e a anca do lado da injeção, fletidos lateralmente e fémur ligeiramente dobrado para dentro, para minimizar a dor (Rodger & King, 2000)
  - Opção 2 (área dorsoglútea): decúbito ventral, com os pés virados para dentro ou em posição lateral com joelhos e ancas dobrados
- Localize a área utilizando os pontos anatômicos. Existem duas técnicas de localização (Rodger & King, 2000):
  - Opção 1 (área dorsoglútea): divida o glúteo em 4 quadrantes e selecione o quadrante superior externo (Rodger & King, 2000), cerca de 5-8 cm abaixo da crista ilíaca
  - Opção 2 (área dorsoglútea): palpe a crista ilíaca e o grande trocanter; desenhe uma linha imaginária que liga os dois pontos, determinar o ponto médio da linha e a punção será localizada acima e para fora a partir desse ponto (Rodger & King, 2000). O trajeto do nervo ciático encontra-se paralelo e abaixo desta linha
  - Opção 3 (área ventro glútea): coloque a sua mão sobre o trocânter maior do quadril. Aponte o polegar na direção da virilha e os restantes dedos para a cabeça ao longo da crista ilíaca. Os seus dedos indicador e do meio e a crista

ilíaca formam um triângulo invertido. A zona de injeção situa-se no centro do triângulo

- Selecione a zona de injeção apropriada ao avaliar o tamanho e a integridade do músculo, se há alguma área da pele danificada, a acessibilidade e a mobilidade (Rodger & King, 2000). Palpe a área para excluir áreas de sensibilidade ou tumefação e avalie eventuais hematomas ou áreas de infeção
- Limpe a área com compressa e antisséptico. Aplique a compressa no centro da área e faça movimentos circulares para o exterior (aproximadamente 5 cm). O desinfetante deve estar em contacto com a pele durante pelo menos 30 segundos, para desinfetar adequadamente e evitar dor e irritação ao introduzir a agulha antes de o antisséptico secar (Hunter, 2008)

Alguns autores sugerem que, se a pele do paciente não está suja e se o enfermeiro lavou as mãos e toma medidas assépticas durante o procedimento, não é necessário desinfetar a área (Hunter, 2008 e Ogston Tuck-S, 2014)

- Retire a tampa da agulha, segure a seringa entre o polegar e o dedo indicador como um dardo, mantendo-a a um ângulo de 90° com a palma da mão voltada para baixo
- Administre a injeção: injete rapidamente a agulha no músculo a um ângulo de 90 graus (se o doente tiver pouca massa muscular, realizar prega cutânea). A agulha deve penetrar a pele rapidamente para evitar maior desconforto para o doente (Ogston Tuck-S, 2014)
- Após a agulha ter penetrado a pele, segure a extremidade inferior da seringa com a sua mão não-dominante para estabilizar a seringa
- Evite mover a seringa. Puxe lentamente o êmbolo da seringa para fora; se não aparecer sangue, injete a medicação lentamente, a uma velocidade de 1 ml/aproximadamente 10 segundos (Hunter, 2008 e Ogston Tuck-S, 2014). Não deve haver aspiração quando a injeção intramuscular se destina a administrar uma vacina (Recomendações Gerais sobre a Imunização. Recomendações do Comité Consultivo de Práticas de Imunização. Recomendações e Relatório, 2006) e quando se usa a região ventro glútea
- Aguarde 10 segundos e, em seguida, remova a agulha suavemente mas com firmeza, enquanto aplica uma leve pressão com uma compressa com antisséptico sobre a punção:
  - Opção 1: Não massageie a área, pois pode causar irritação por infiltração da medicação através do orifício de entrada (Martínez-Espejo Sánchez & Armero Barranco, 2007 e Hunter, 2008)



- Opção 2: Faça uma leve massagem na área durante alguns segundos (Martínez-Espejo Sánchez & Armero Barranco, 2007 e Hunter, 2008)
- Descarte a agulha, ativando o sistema de segurança, e coloque-o no recipiente especial de objetos cortos perfurantes e aplique um penso rápido
- Descarte o restante material utilizado (selecione o recipiente adequado para o lixo) e lave as mãos
- Avalie a eficácia da medicação, 15 a 20 minutos após a administração (em analgésicos, antieméticos, etc.)
- Avalie o local da punção 2-4 horas após a injeção, relativamente a sinais de irritação local
- Nas áreas ventro glútea e vasto lateral, promova exercícios com o membro inferior

## 5. Possíveis complicações e/ou aspetos a ter em consideração

As complicações potenciais de qualquer injeção intramuscular incluem dores, contraturas, paralisia, lesão de nervo periférico, irritação local, infeção, neuropatias, hematomas, hemorragia, nódulos persistentes, punção arterial, fibrose, abscesso, gangrena, necrose tecidual e contrações musculares (Rodger & King, 2000). Note-se também que a administração constante numa área pode causar fibrose local, o que causa uma redução progressiva de absorção.

### Considerações sobre as estruturas anatómicas relacionadas com a punção:

#### Músculo glúteo / ventro glúteo

- Vários autores consideram o glúteo como a área de eleição para a injeção intramuscular (Brown, Gillespie & Chade, 2015 e Ogston Tuck-S, 2014)
- O uso desta área reduz o risco associado com lesão por injeção IM (Rodger & King, 2000).
- Não há perigo de puncionar o nervo ciático ou grandes vasos, e a camada adiposa é muito mais fina do que na área dorsoglútea (Martínez-Espejo Sánchez & Armero Barranco, 2007 e Tuck, 2014)
- Alguns autores sugerem que não é um local adequado em crianças com menos de 3 anos de idade (Rodger & King, 2000)
- Alguns autores sugerem que é o local de eleição em doentes acamados, pois estes têm frequentemente um glúteo máximo atrofiado (Rodger & King, 2000)

### Zona dorsoglútea (glúteo máximo)

- Existe o risco de atingir o nervo ciático. Isto pode causar paralisia temporária ou permanente da perna afetada
- Existe o risco de atingir os grandes vasos sanguíneos (artéria e veia ciática) e perfurá-los (Brown, Guillespie & Chad, 2015)
- A existência de uma grande quantidade de tecido adiposo, além da proximidade dos nervos e vasos sanguíneos principais, torna este local problemático (Rodger & King, 2000)
- Não devem ser dadas injeções nesta área enquanto o doente estiver de pé (Rodger & King, 2000)
- Não recomendado para crianças com menos de 10 anos de idade (Brown & Guillespie, Chad, 2015)

## Referências Bibliográficas

Brown, J., Gillespie, M. & Chard, S. (2015). The dorso–ventro debate: in search of empirical evidence. *British Journal of Nursing*, 24 (22), 1132-1139.

Hunter, J. (2008). Intramuscular injection techniques. *Nursing Standard*, 22 (24), 35-40.

Martínez-Espejo Sánchez, M. D., & Armero Barranco, D. (2007). *Procedimientos clínicos en enfermería del adulto (2ª Ed)*. Murcia: Librero-Editor.

Ogston-Tuck, S. (2014). Intramuscular injection technique: an evidence-based approach. *Nursing Standard*, 29 (4), 52-59.

Perry, A. G., & Potter, P. A. (1999). *Enfermería clínica: Técnicas y Procedimientos (4ª Ed)*. St.Louis: Harcourt – Mosby.

Rodger, M. & King, L. (2000). Drawing up and administering intramuscular injections: A review of a literature. *Journal of Advanced Nursing*, 31 (3), 574-582.

# Procedure in Nederlands: Intramusculaire Injectie

---

## 1. Definitie van de procedure

De techniek “intramusculaire inspuiting” (IM) omvat het inbrengen van een naald in een spier om een geneesmiddel in dieper gelegen spierweefsel te injecteren.

## 2. Therapeutic indications and Contraindications

- IM toedieningswijze geniet de voorkeur wanneer orale toediening niet aangewezen is omwille van de toestand van de zorgvrager of eigenschappen van het geneesmiddel.
- Deze techniek is eenvoudiger en minder risicovol dan de intraveneuze toedieningswijze.
- Deze techniek maakt toediening van een breder gamma aan farmaceutische producten en grotere volumes mogelijk dan de subcutane toedieningswijze en is even effectief als intraveneuze toedieningswijze.
- Naast de intraveneuze toedieningswijze heeft de parenterale toedieningswijze eveneens een snelle absorptie. De vascularisatie van het spierweefsel zorgt voor een absorptie van het geneesmiddel van 10 tot 30 minuten tegenover 30 minuten wanneer een geneesmiddel via subcutane toediening wordt toegediend.
- Voor toediening van irriterende geneesmiddelen geniet de IM toedieningswijze de voorkeur ten opzichte van andere toedieningswijzen.

### Contraindicaties:

Afhankelijk van het geneesmiddel moeten volgende aanprikplaatsen vermeden worden: beschadigde huid, gevoeligheid of verharding van de huid, hematomen en geïnfecteerde plaatsen en zones die moeilijk bereikbaar zijn of de mobiliteit van de zorgvrager beperken (Rodger & King, 2000).

## 3. Materiaal

- Geneesmiddelendossier (voorschrift van de arts)
- Spuitenplateau of verpleegkar
- Ampul of flacon van het geneesmiddel
- Onsteriele wegwerphandschoenen
- 2 of 3 ml spuit voor volwassenen of 0,5 ml spuit voor kinderen en baby's

- Optreknaald maat 18-21 G, lengte 25 mm en intramusculaire naald 21 G, lengte 40 mm. Voor toediening van een intramusculaire inspuiting bij een obese zorgvrager wordt best een naald van minstens 5 cm gebruikt.
- Kompres met ontsmettingsmiddel (70% alcohol) en/of alcoholswab. Vermijd gebruik van katoenen watte omwille van pluisvorming die bij het aanprikken in de huid kunnen gebracht worden.
- Naaldcontainer en afvalzakje

## 4. Stappenplan

Er zijn vijf zones waar een intramusculaire inspuiting gegeven kan worden (Rodger & King, 2000): musculus deltoïdeus, musculus rectus femoralis, musculus vastus lateralis en musculus gluteus maximus (via dorsogluteale of ventrogluteale techniek) In dit document wordt de intramusculaire inspuiting in de musculus gluteus maximus via de Dorso gluteale (DG) en de Ventro gluteale (VG) techniek toegelicht.

### Stappenplan:

- Informeer de zorgvrager over de procedure en het geneesmiddel dat toegediend zal worden.
- Zorg voor privacy, sluit de gordijnen en de deur
- Pas handhygiëne toe
- Bedek de lichaamsdelen die niet ontbloot moeten worden met een laken of kledingstuk.
- Help de zorgvrager om een goeie houding aan te nemen:
  - Optie 1 (ventrogluteale zone): laterale of rugligging met de knie- en heupzijde aan de injectiezijde gebogen en het femur licht naar binnen gedraaid, om pijn te minimaliseren (Rodger & King, 2000).
  - Optie 2 (dorsogluteale area): buikligging van de patiënt, voeten naar binnen gekeerd of opzij met gebogen knieën en heupen.
- Lokaliseer de aanprikplaats op basis van de anatomische structuren. Er zijn twee technieken om de aanprikplaats te lokaliseren. (Rodger & King, 2000):
  - Optie 1 (dorsogluteale zone): Verdeel de bil in 4 kwadranten en kies het buitenste bovenste kwadrant (Rodger & King, 2000), ongeveer 5 tot 8 cm onder de crista iliaca.
  - Optie 2 (dorsogluteale zone): Palpeer de crista iliaca en de grote trochanter. Trek een denkbeeldige lijn tussen deze structuren. Bepaal het middelpunt van

deze lijn. De punctieplaats bevindt zich boven en naast dit punt (Rodger & King, 2000). De nervus ischiadicus loopt parallel aan en onder deze lijn.

- Optie 3 (ventrogluteale zone): Plaats de hand over de trochanter. De duim wijst naar de lies, de rest van de vingers naar het hoofd, deze volgen de rand van de crista iliaca. De wijsvinger, middenvinger en rand van de crista iliaca vormen een driehoek. De inspuitingplaats bevindt zich in het midden van deze driehoek.
- Beoordeel de aanprikplaats, evalueer de omvang en toestand van de spier, aanwezigheid van eventueel huidletsels, bereikbaarheid van de aanprikplaats en mobiliteit van de zorgvrager (Rodger & King, 2000). Palpeer de aanprikplaats om prikken in gevoelige plaatsen of verhardingen uit te sluiten en controleer of er geen hematomen of infecties zijn.
- Reinig de huid met een kompres en ontsmettingsmiddel. Start hiervoor in het midden van de aanprikplaats en maak een roterende beweging naar buiten toe tot een diameter van 5 cm. Wacht na het ontsmetten minstens 30 seconden om te zorgen dat de huid voldoende ontsmet is en om pijn en irritatie bij het aanprikken te voorkomen wanneer de ontsmetting niet opgedroogd zou zijn (Hunter, 2008).

Sommige auteurs adviseren om de huid niet te ontsmetten voor het geven van een intramusculaire injectie wanneer de huid niet zichtbaar bevuild is en de verpleegkundige handhygiëne heeft toegepast en principes van aseptie hanteert tijdens de uitvoering (Hunter, 2008 and Ogston-Tuck, 2014).

- Verwijder het omhulsel van de naald, houd de spuit tussen duim en wijsvinger in een hoek van 90° ten opzichte van de handpalm.
- Voer de inspuiting uit. Breng de naald vlot in de spier in een hoek van 90°. (Wanneer de spiermassa klein is, knijp deze spier samen.) De naald moet snel door de huid gaan om verder discomfort van de zorgvrager te voorkomen (Ogston-Tuck, 2014).
- Wanneer de naald ter plaatse is, fixeer het onderste deel van de spuit met de niet-dominante hand.
- Vermijd bewegingen van de spuit. Aspireer zacht. Wanneer geen bloed verschijnt, injecteer je het geneesmiddel langzaam met een snelheid van 1 ml per 10 seconden (Hunter, 2008 and Ogston-Tuck, 2014). Wanneer een vaccin wordt toegediend door middel van een IM inspuiting, is aspireren niet noodzakelijk bij het aanprikken in de ventrogluteale zone (General Recommendations on Immunisation. Recommendations from the Advisory Committee on Immunisation Practices. Recommendations and Report, 2006).

- Wacht 10 seconden en verwijder dan de voorzichtig maar snel de naald terwijl je met de andere hand lichte druk uitoefent op de insteekplaats met een ontsmettend kompres
  - Optie 1: Masseer de inspuitingplaats niet. Dit kan leiden tot irritatie ten gevolge van filtratie van het geneesmiddel door de insteekpoort (Martínez-Espejo Sánchez & Armero Barranco, 2007 and Hunter, 2008)
  - Optie 2: Masseer zacht de insteekplaats (Martínez-Espejo Sánchez & Armero Barranco, 2007 and Hunter, 2008)
- Verwijder de naald door gebruik te maken van het veiligheidssysteem en deponeer het in de naaldcontainer.
- Ruim al het gebruikte materiaal op in de juiste afvalcontainer en voer handhygiëne uit.
- Beoordeel de effectiviteit van het geneesmiddel 15 tot 20 minuten na toediening (analgeticum, anti-emeticum etc.)
- Controleer 2 tot 4 u na toediening van de inspuiting de huid om symptomen die wijzen op lokale irritatie uit te sluiten.
- In geval de intramusculaire inspuiting werd toegediend in de musculus vastus lateralis of de VG techniek werd toegepast, is het aangewezen om de zorgvrager beenoefeningen te laten uitvoeren.

## 5. Potentiële complicaties en/of aandachtspunten die in acht genomen moeten worden

Potentiële complicaties van IM inspuitingen zijn: pijn, contracturen, paralyse, perifere zenuwbeschadiging, lokale irritatie, infectie, neuropathie, ecchymose, bloeding, ontstaan van harde nodules, arteriële puncties, fibrosevorming, abcesvorming, weefselnecrose, gangreen en spierstijfheid (Rodger & King, 2000). Opgemerkt moet worden dat wanneer constant wordt ingespoten in eenzelfde zone, lokaal fibrose kan optreden wat kan leiden tot een progressieve verminderde absorptie van de geïnjecteerde producten in deze zone.

### **Aandachtspunten ten aanzien van anatomische structuren gerelateerd aan de punktieplaats:**

#### Musculus gluteus/ventrogluteale spier

- Veel auteurs geven de voorkeur aan deze techniek voor IM gluteale inspuitingen (Brown, Guillespie & Chad, 2015 and Ogston Tuck-S, 2014).
- Het gebruik van deze techniek reduceert de risico's die geassocieerd zijn met IM inspuitingen (Rodger & King, 2000)

- Er is geen gevaar voor het aanprikken van de nervus ischiaticus of grote bloedvaten. De vetlaag is veel dunner dan in de zone die aangeprikt wordt bij de DG techniek (Martínez-Espejo Sánchez & Armero Barranco, 2007 and Tuck, 2014)
- Sommige auteurs zijn van oordeel dat dit geen aangewezen techniek is om toe te passen bij kinderen jonger dan 3 jaar (Rodger & King, 2000).
- Sommige auteurs bevelen deze techniek aan bij immobiele zorgvragers omdat deze vaak atrofie hebben van de musculus gluteus maximus (Rodger & King, 2000).

#### Dorsogluteale zone (musculus gluteus maximus)

- Er bestaat een risico op het aanprikken van de nervus ischiaticus. Dit kan leiden tot blijvende paralyse van het been aan de aangeprikte zijde.
- Er bestaat een risico op het aanprikken van een groot bloedvat (arteria ischiaticus en vena ischiaticus), waardoor een bloeding kan ontstaan (Brown, Gillespie & Chad, 2015).
- De aanwezigheid van een grote hoeveelheid vetweefsel en de nabijheid van zenuwbanen en grote bloedvaten, kan problemen veroorzaken bij het hanteren van deze techniek (Rodger & King, 2000).
- Deze techniek mag niet worden toegepast bij een staande zorgvrager (Rodger & King, 2000).
- Deze techniek is niet aangewezen om toe te passen bij kinderen onder 10 jaar omwille van verminderde absorptie (Brown, Gillespie & Chad, 2015).



## References

Brown, J., Gillespie, M. & Chard, S. (2015). The dorso–ventro debate: in search of empirical evidence. *British Journal of Nursing*, 24 (22), 1132-1139.

Hunter, J. (2008). Intramuscular injection techniques. *Nursing Standard*, 22 (24), 35-40.

Martínez-Espejo Sánchez, M. D., & Armero Barranco, D. (2007). *Procedimientos clínicos en enfermería del adulto (2ª Ed)*. Murcia: Librero-Editor.

Ogston-Tuck, S. (2014). Intramuscular injection technique: an evidence-based approach. *Nursing Standard*, 29 (4), 52-59.

Perry, A. G., & Potter, P. A. (1999). *Enfermería clínica: Técnicas y Procedimientos (4ª Ed)*. St.Louis: Harcourt – Mosby.

Rodger, M. & King, L. (2000). Drawing up and administering intramuscular injections: A review of a literature. *Journal of Advanced Nursing*, 31 (3), 574-582.

## CHAPTER 5

# Nasogastric Tube Insertion

---

*Maria da Conceição Giestas Baía Saraiva, Luís Leitão Sarnadas, Verónica Rita  
Dias Coutinho & Rui Carlos Negrão Baptista*

# Procedure in English: Nasogastric Tube Insertion

---

## 1. Definition of procedure

Nasogastric tube (NGT) insertion is a nursing procedure, which should be performed according to the protocol and/or guidelines in force and the medical prescription. It involves the insertion of a tube through the nose down into the stomach (ACSS 2011).

## 2. Therapeutic indications and Contraindications

According to the above-mentioned authors, this procedure serves both therapeutic and diagnostic purposes.

Therapeutic indications include:

- Relieving nausea and vomiting
- Reduce abdominal distension
- Administer medication and/or enteral feeding
- Prepare the patient for complementary exams or surgical procedures
- Remove toxic substances or blood from the stomach

According to the Saskatoon Health Region (2017) manual, NGT insertion is also used to remove fluid and gas from the intestinal tract, treat gastric immobility and bowel obstructions, and allow for drainage and/or lavage in drug overdoses or poisonings.

Reported that NGT insertion is performed with a diagnostic purpose when it is necessary to aspirate gastric contents for analysis.

### **Contraindications:**

The insertion of a NGT is contraindicated in patients with fractured skull, severe facial trauma, particularly in patients with nasal and esophageal obstruction, esophageal varices, airway obstruction, and coagulation disorders.

## 3. Materials

According to the literature (Potter & Perry, 2006; ACSS, 2011; Saskatoon Health Region, 2017), the following material and equipment are required to perform this procedure:

- Tray
- Nasogastric Tube (NGT): type and size appropriate to the clinical situation - 8 or 14 Fr for adults

- Water-soluble lubricating gel
- Local anesthetic
- Disposable pad
- Glass of water; glass of water with ice chips
- Non-sterile gloves
- Mask with attached visor
- Tongue depressor and/or spatula
- Facial tissues
- Emesis basin
- Fixation device
- pH indicator strips
- 50-60cc catheter tipped syringe
- Drainage bag
- Container for hazardous hospital waste
- Suction equipment (low pressure)

#### 4. Stages of the procedure

The NGT should be selected according to the purpose of the procedure and the patient's health status, while respecting their privacy.

##### **Procedure:**

With regard to the procedure itself, it should be performed using a clean technique and gentle movements. According to Taylor, Lillis, and LeMone (2007), the procedure should be discontinued and the tube removed if there are any signs of distress during tube insertion, such as coughing, gasping, cyanosis, and inability to speak or if water vapor is detected inside the tube. The professional should wait a few minutes before proceeding with intubation.

Based on a literature review, the procedure steps were identified and synthesized (Table 1).

Table 1. Stages of the procedure

Nursing interventions	Rationale
1- Ascertain the need for the nasogastric tube (aspiration, decompression or feeding)	
2- Provide privacy (Saskatoon Health Region 2017) Bring the supplies closer to the patient (ACSS, 2011)	Promotes time management
3- Perform hand hygiene	Prevents contamination
4- Identify the correct patient. Explain the procedure to the patient Obtain consent (Saskatoon Health Region 2017) Explain to the patient that they can raise a finger if they feel discomfort or choking (Potter, Perry, 2006).	Promotes patient collaboration and reduces patient anxiety
5- If possible, place the patient in Fowler or semi-Fowler's position (ACSS, 2011; Saskatoon Health Region 2017; Potter, Perry, 2006)	Facilitates the procedure Prevents aspiration of gastric contents when vomiting
6- Clean the nose and identify the most patent nostril Wash nose and nostril with water (Saskatoon Health Region 2017)	Facilitates tube insertion
7- Provide emesis basin and paper tissues	Facilitates in case of vomiting
8- Place disposable pad on the chest	Protects in case of vomiting
9- Put on gloves	Protects the professional from exposure to blood or body fluids
10- Measure the length of the tube to be inserted (nose/earlobe/xiphoid process) (ACSS, 2011; Saskatoon Health Region 2017) and mark tube at this measurement (Saskatoon Health Region 2017; Potter, Perry, 2006)	Determines length of tube to be inserted
11- Lubricate end of tube (ACSS, 2011; Saskatoon Health Region 2017)	Minimizes trauma

Nursing interventions	Rationale
<p>12- Gently insert the tube into the nostril directing downward and backward toward the ear (Saskatoon Health Region 2017). Instruct the patient to extend neck back until the tube has passed the nasopharynx. Allow patient to relax (Saskatoon Health Region 2017; Potter, Perry, 2006). Instruct the patient to flex head forward, take a small sip of water and swallow until the tube is fully inserted (as far as marked length) (ACSS, 2011; Saskatoon Health Region 2017). Underline the need to breathe through the mouth and swallow (Potter, Perry, 2006) Discontinue the procedure and remove the tube if there are any signs of distress during tube insertion, such as coughing, gasping, cyanosis, and inability to speak (Taylor, Lillis, &amp; LeMone, 2007) or if there is water vapor inside the tube</p> <p>Wait a few minutes before proceeding with intubation</p>	<p>Facilitates tube insertion.</p> <p>Prevents complications</p>
<p>13- Aspirate gastric contents and test pH <math>\leq</math> 5.5 (Saskatoon Health Region 2017)</p> <p>In the absence of stomach contents, inject 15 to 20cc of air, auscultating for bowel sounds in the epigastric region. (ACSS, 2011; Saskatoon Health Region 2017)</p> <p>An X-ray may be ordered to confirm placement (Saskatoon Health Region 2017)</p>	<p>Allows checking tube placement in the stomach and its permeability</p> <p>Reduces uncertainty and helps to determine tube placement</p>
<p>14- Clamp end of tube or connect to drainage bag or low-pressure suction depending on the purpose of the intubation.</p>	<p>Prevents entry of air and reflux of gastric contents or promotes passive drainage or suction</p>
<p>15- Clean the skin around the nose if necessary</p>	<p>Facilitates tube placement</p>
<p>16- Safely secure tube to nose tape, avoiding pressure</p>	<p>Prevents tube displacement and facilitates bed mobility. Prevents skin irritation and/or lesion</p>
<p>17- Clean nose and provide mouth care</p>	
<p>18- Position the patient</p>	
<p>19- Remove gloves</p>	
<p>20- Assess the patient's condition</p>	
<p>21- Gather and wash the equipment</p>	
<p>22- Perform hand hygiene</p>	<p>Prevents cross-contamination</p>

Nursing interventions	Rationale
<p>Documentation:</p> <p>It is important to keep the following records (ACSS, 2011; Saskatoon Health Region 2017):</p> <p>Date and time of tube insertion</p> <ul style="list-style-type: none"> <li>- Type and size of the tube</li> <li>- Color and amount of gastric contents aspirated</li> <li>- Ph reading and tube placement confirmation through X-ray, if prescribed</li> <li>- Nursing diagnosis and interventions and obtained results</li> <li>- If tube was clamped, drainage or irrigation</li> <li>- Health education</li> <li>- Name of person performing the procedure</li> </ul>	<p>Enables care continuity</p>

In addition to these interventions, it is also important to monitor the tube (positioning, folding, and obstruction), as well as irrigate it, if necessary, lubricate the nasal mucosa, and provide regular oral hygiene to the patient.

## 5. Potential complications and/or aspects to take into account

With regard to potential complications, NGT insertion is a procedure entailing some risks, including esophageal perforation, aspiration, fistula formation, and knotting of the tube. Another risk associated with this procedure is the inadvertent placement of the tube in the trachea, which can lead to severe complications such as pleural injury, pneumothorax, tracheobronchial aspiration, pneumonia, and death if fluids or other agents are infused (Saskatoon Health Region 2017).

According to ACSS (2011), nostril ulcer, sinusitis, gastric ulcer, and vomiting are other complications associated with the prolonged presence of a NGT.

## References

- ACSS Administração Central do Sistema de Saúde, IP (2011). Manual de Normas de Enfermagem Procedimentos Técnicos. 2ª Edição Revista. Retrieved from <http://forumenfermagem.org/dossier-tecnico/documentos/orientacoes-tecnicas/manual-de-procedimentos-tecnicos-de-enfermagem-acss#.WmcsGahl9PYY>
- Ministry of Health. (2010). Moh Nursing Clinical Practice Guidelines 1/2010: Nursing Management of Nasogastric Tube Feeding in Adult Patients. Singapore. Retrieved from [https://www.moh.gov.sg/content/dam/moh\\_web/HPP/Nurses/cpg\\_nursing/2010/nasogastric%20tube%20feeding%20-%20book.pdf](https://www.moh.gov.sg/content/dam/moh_web/HPP/Nurses/cpg_nursing/2010/nasogastric%20tube%20feeding%20-%20book.pdf)
- Potter, P.A. & Perry, A.G. (2006). Fundamentos de enfermagem: conceitos e procedimentos (5ªed.). Loures, Portugal: Lusociência.
- Saskatoon Health Region, Saskatoon Health Region Nursing Practice Committee, & Interprofessional NG Tube Safety Working Group. (2017). Nasogastric/orogastric tube: insertion, care of, and removal: Adult. Saskatoon, Canada. Retrieved from <https://www.saskatoonhealthregion.ca/about/NursingManual/1040.pdf>
- Taylor, C.; Lillis, C. & LeMone, P. (2007). Fundamentos de enfermagem. A arte e a ciencia do cuidado de enfermagem (5aed.). Porto Alegre, Brasil: Artmed.



## Procedure in Spanish: Sondaje nasogástrico

---

### 1. Definición del procedimiento

La inserción de una sonda nasogástrica es un procedimiento de enfermería que debe realizarse de acuerdo con el protocolo y/o las pautas vigentes, y la prescripción médica. Implica la inserción de una sonda a través de la nariz hasta el estómago (ACSS 2011).

### 2. Indicaciones terapéuticas y contraindicaciones

Este procedimiento sirve tanto para fines terapéuticos como para diagnósticos.

Las indicaciones terapéuticas incluyen:

- Aliviar las náuseas y vómitos
- Reducir la distensión abdominal
- Administrar medicación y/o alimentación enteral
- Preparar al paciente para exámenes complementarios o procedimientos quirúrgicos
- Retirar sustancias tóxicas o sangre del estómago

De acuerdo con el manual de Saskatoon Health Region (2017), el sondaje nasogástrico se usa también para eliminar líquidos y gases del tracto intestinal, tratar la inmovilidad gástrica y las obstrucciones intestinales, y permitir el drenaje y/o lavado gástrico por sobredosis de drogas o intoxicaciones. Este autor apunta a que el sondaje nasogástrico se realiza con un propósito diagnóstico cuando es necesario aspirar el contenido gástrico para su análisis.

#### **Contraindicaciones:**

El sondaje nasogástrico está contraindicado en pacientes con fractura de cráneo, traumatismo facial grave, particularmente en pacientes con obstrucción nasal y esofágica, varices esofágicas, obstrucción de las vías respiratorias y trastornos de la coagulación.

### 3. Materiales

De acuerdo con la literatura (Potter & Perry, 2006; ACSS, 2011; Saskatoon Health Region, 2017), se requieren los siguientes materiales y equipos para realizar este procedimiento:

- Bandeja
- Sonda nasogástrica de tipo y tamaño apropiados para la situación clínica: 8 ó 14 Fr para adultos
- Gel lubricante soluble en agua

- Anestesia local
- Toalla o empapador desechable
- Vaso de agua o vaso de agua con cubito de hielo
- Guantes no estériles
- Pantalla facial
- Depresor de lengua y/o espátula
- Pañuelos de papel
- Recipiente para el vómito
- Dispositivo de fijación
- Tiras indicadoras de pH
- Jeringa con punta de catéter de 50-60cc.
- Bolsa de drenaje
- Contenedor de residuos hospitalarios peligrosos
- Equipo de aspiración (baja presión)

#### 4. Pasos del procedimiento

El sondaje nasogástrico debe seleccionarse de acuerdo con el propósito del procedimiento y el estado de salud del paciente, respetando su privacidad.

##### **Procedimiento:**

Con respecto al procedimiento en sí, debe realizarse utilizando una técnica limpia y movimientos suaves. Según Taylor, Lillis y LeMone (2007), el procedimiento debe interrumpirse y retirarse la sonda si hay signos de angustia durante la inserción de la sonda, como tos, jadeo, cianosis e incapacidad para hablar, o si se detecta vapor de agua dentro de la sonda. El profesional debe esperar unos minutos antes de proceder con la intubación.

Basándose en una revisión bibliográfica, se identificaron y sintetizaron los pasos del procedimiento (tabla 1).

Tabla 1. Pasos del procedimiento

Intervenciones de enfermería	Fundamento
1-Determine la necesidad de la sonda nasogástrica (aspiración, descompresión o alimentación)	
2- Proporcione y asegure la privacidad del paciente (Saskatoon Health Region, 2017). Aproxime los materiales al paciente (ACSS, 2011)	Promueve la gestión del tiempo
3- Realice la higiene de las manos	Previene la contaminación
4- Identifique al paciente correcto. Explique el procedimiento. Obtenga su consentimiento (Saskatoon Health Region, 2017) Explique al paciente que puede levantar un dedo si siente incomodidad o asfixia (Potter, Perry, 2006)	Promueve la colaboración del paciente y reduce su ansiedad
5- Si es posible, coloque al paciente en posición de Fowler o semi-Fowler (ACSS, 2011; Saskatoon Health Region, 2017; Potter, Perry, 2006)	Facilita el procedimiento Evita la aspiración del contenido gástrico en caso de vómito
6- Limpie la nariz del paciente e identifique la fosa nasal más grande. Lavar la fosa nasal con agua (Saskatoon Health Region, 2017)	Facilita la introducción de la sonda
7- Proporcione un recipiente de vómito y pañuelos de papel	Facilita en caso de vómito
8- Coloque la toalla o el empapador desechable en el pecho del paciente	Protege en caso de vómito
9- Pongase los guantes	Protege al profesional de la exposición a la sangre o a fluidos corporales
10- Mida la longitud de la sonda a insertar (proceso de la nariz / lóbulo de la oreja / xifoides), (ACSS, 2011; Saskatoon Health Region 2017), y marque la sonda en esta medida (Saskatoon Health Region, 2017; Potter, Perry, 2006)	Determina la longitud de la sonda a insertar
11- Lubrique el extremo de la sonda (ACSS, 2011; Saskatoon Health Region, 2017)	Minimiza traumas

Intervenciones de enfermería	Fundamento
<p>12- Inserte suavemente la sonda en la fosa nasal hacia abajo y dirigida hacia el lóbulo de la oreja (Saskatoon Health Region, 2017). Indique al paciente que extienda el cuello hacia atrás hasta que la sonda haya pasado la nasofaringe. Permita que el paciente se relaje (Saskatoon Health Region, 2017; Potter, Perry, 2006). Indique al paciente que flexione la cabeza hacia adelante, tome un pequeño sorbo de agua y trague hasta que la sonda esté completamente insertada (hasta la longitud marcada) (ACSS, 2011; Saskatoon Health Region, 2017). Recalque la necesidad de respirar por la boca y tragar (Potter, Perry, 2006) Interrumpa el procedimiento y retire la sonda si hay signos de dolor durante la inserción la misma, como tos, jadeo, cianosis e incapacidad para hablar (Taylor, Lillis, &amp; LeMone, 2007), o si hay vapor de agua dentro de la sonda Espere unos minutos antes de continuar la intubación</p>	<p>Facilita el sondaje</p> <p>Previene complicaciones</p>
<p>14- Sujete el extremo de la sonda y conecte al drenaje de bolsa o succión a baja presión, según el propósito de la intubación</p>	<p>Previene la entrada de aire y el reflujo del contenido gástrico o favorece el drenaje pasivo o la succión</p>
<p>15- Limpie la piel alrededor de la nariz si es necesario</p>	<p>Facilita la colocación de la sonda</p>
<p>16- Sujete firmemente la sonda con la cinta nasal, evitando la presión</p>	<p>Previene el desplazamiento de la sonda y facilita la movilidad de la cama Previene la irritación y/ o lesión de la piel</p>
<p>17- Limpie la nariz y cuide la boca</p>	
<p>18- Coloque al paciente en posición cómoda</p>	
<p>19- Retire los guantes</p>	
<p>20- Evalúe el estado del paciente</p>	
<p>21- Recoja el equipo</p>	
<p>22- Realice higiene de manos</p>	<p>Previene la contaminación</p>

Intervenciones de enfermería	Fundamento
<p>Documentación</p> <p>Es importante mantener los siguientes registros (ACSS, 2011; Saskatoon Health Region 2017):</p> <ul style="list-style-type: none"> <li>- Fecha y hora de inserción de la sonda</li> <li>- Tipo y tamaño de la sonda</li> <li>- Color y cantidad de contenidos gástricos aspirados</li> <li>- Lectura de pH y confirmación de colocación de la sonda a través de rayos X, si se prescribe</li> <li>- Diagnóstico e intervenciones de enfermería y resultados obtenidos</li> <li>- Si la sonda fue pinzada, si drena o si es para lavado</li> <li>- Educación para la salud</li> <li>- Nombre de la persona que realiza el procedimiento</li> </ul>	<p>Permite la continuidad del cuidado</p>

Además de estas intervenciones, también es importante controlar la sonda (posicionamiento, plegado y obstrucción), así como irrigarla, proporcionar una higiene oral regular al paciente y, si es necesario, lubricar la mucosa nasal.

## 5. Complicaciones potenciales y/o aspectos a considerar

Con respecto a las posibles complicaciones, la inserción de la SNG es un procedimiento que conlleva algunos riesgos, como la perforación esofágica, la aspiración, la formación de fístulas y el anudamiento de la sonda. Otro riesgo asociado con este procedimiento es la inserción involuntaria de la sonda en la tráquea, que puede provocar complicaciones graves como lesión pleural, neumotórax, aspiración traqueobronquial, neumonía y muerte si se infunden líquidos u otros agentes (Saskatoon Health Region 2017). Según ACSS (2011), la aparición de úlcera nasal, la sinusitis, la úlcera gástrica y el vómito son otras complicaciones asociadas con la presencia prolongada de una SNG.

## Referencias

ACSS Administração Central do Sistema de Saúde, IP (2011). Manual de Normas de Enfermagem Procedimentos Técnicos. 2ª Edição Revista. Retrieved from <http://forumenfermagem.org/dossier-tecnico/documentos/orientacoes-tecnicas/manual-de-procedimentos-tecnicos-de-enfermagem-acss#.WmcsGahI9PYY>

Ministry of Health. (2010). Moh Nursing Clinical Practice Guidelines 1/2010: Nursing Management of Nasogastric Tube Feeding in Adult Patients. Singapore. Retrieved from [https://www.moh.gov.sg/content/dam/moh\\_web/HPP/Nurses/cpg\\_nursing/2010/nasogastric%20tube%20feeding%20-%20book.pdf](https://www.moh.gov.sg/content/dam/moh_web/HPP/Nurses/cpg_nursing/2010/nasogastric%20tube%20feeding%20-%20book.pdf)

Potter, P.A. & Perry, A.G. (2006). Fundamentos de enfermagem: conceitos e procedimentos (5ªed.). Loures, Portugal: Lusociência.

Saskatoon Health Region, Saskatoon Health Region Nursing Practice Committee, & Interprofessional NG Tube Safety Working Group. (2017). Nasogastric/orogastric tube: insertion, care of, and removal: Adult. Saskatoon, Canada. Retrieved from <https://www.saskatoonhealthregion.ca/about/NursingManual/1040.pdf>

Taylor, C.; Lillis, C. & LeMone, P. (2007). Fundamentos de enfermagem. A arte e a ciencia do cuidado de enfermagem (5aed.). Porto Alegre, Brasil: Artmed.

# Procedure in Portuguese: Inserção de Sonda Nasogástrica

---

## 1. Definição de procedimento

A inserção de sonda nasogástrica (SNG) é um procedimento de enfermagem que deve ser realizado de acordo com o protocolo e/ou orientações em vigor e a prescrição médica. Consiste na inserção de um tubo pelo nariz até ao estômago (ACSS 2011).

## 2. Indicações terapêuticas e contraindicações

Segundo os autores acima mencionados, este procedimento serve para fins terapêuticos e diagnósticos.

As indicações terapêuticas incluem:

- Alívio de náuseas e vômitos
- Redução da distensão abdominal
- Administração de medicação e/ou alimentação enteral
- Preparação do doente para exames complementares ou procedimentos cirúrgicos
- Remoção de substâncias tóxicas ou sangue do estômago

De acordo com o manual de Saskatoon Health Region (2017), a inserção de SNG também é usada para remover fluidos e gases do trato intestinal, tratar a imobilidade gástrica e obstruções do intestino, e permitir a drenagem e/ou lavagem gastrointestinal em caso de overdoses de drogas ou intoxicações.

Relatado que a inserção de SNG é realizada com o propósito de diagnóstico quando é necessário aspirar o conteúdo gástrico para análise.

### **Contraindicações:**

A inserção de uma SNG está contraindicada em doentes com fratura de crânio, trauma facial grave, especialmente em doentes com obstrução nasal e esofágica, varizes esofágicas, obstrução das vias respiratórias e distúrbios de coagulação.

## 3. Materiais

De acordo com a literatura (Potter & Perry, 2006; ACSS, 2011; Saskatoon Health Region, 2017), os seguintes materiais e equipamentos são necessários para executar este procedimento:

- Tabuleiro

- Sonda nasogástrica (SNG): tipo e tamanho adequado à situação clínica - 8 ou 14 Fr para adultos
- Gel lubrificante solúvel em água
- Anestésico local
- Resguardo descartável
- Copo de água; copo de água com pedaços de gelo
- Luvas não estéreis
- Máscara com visor anexo
- Depressor de língua e/ou espátula
- Lenços faciais
- Bacia para emese
- Dispositivo de fixação
- Tiras indicadoras de pH
- Seringa com ponta de cateter de 50-60 cc
- Saco de drenagem
- Recipiente para resíduos hospitalares perigosos
- Equipamento de aspiração (baixa pressão)

#### 4. Fases do procedimento

A SNG deve ser selecionada de acordo com a finalidade do procedimento e o estado de saúde do doente, respeitando a sua privacidade.

##### **Procedimento:**

Relativamente ao procedimento em si, este deve ser realizado utilizando uma técnica limpa e movimentos suaves. De acordo com Taylor, Lillis, & LeMone (2007), o procedimento deve ser interrompido e o tubo removido se existirem sinais de perigo durante a inserção da sonda, tais como tosse, respiração ofegante, cianose e incapacidade de falar ou se for detetado vapor de água dentro do tubo. O profissional de saúde deve aguardar alguns minutos antes de proceder à inserção da sonda.

Com base numa revisão da literatura, os passos do procedimento foram identificados e sintetizados (Tabela 1).



Tabela 1 - Passos de procedimento

<b>Intervenções de enfermagem</b>	<b>Justificativa</b>
1- Determinar a necessidade da sonda nasogástrica (aspiração, descompressão ou alimentação)	
2- Proporcionar privacidade (Saskatoon Health Region, 2017) Aproximar mais os equipamentos do doente (ACSS, 2011)	Promove a gestão do tempo
3- Higienizar as mãos	Evita a contaminação
4- Identificar o doente correto. Explicar o procedimento ao doente. Obter o consentimento (Saskatoon Health Region, 2017) Explicar ao doente que pode levantar um dedo se sentir desconforto ou asfixia (Potter, Perry, 2006)	Promove a colaboração do doente e reduz a ansiedade do doente
5- Se possível, colocar o doente em posição Fowler ou semi-Fowler (ACSS, 2011; Saskatoon Health Region, 2017; Potter, Perry, 2006)	Facilita o procedimento Evita a aspiração de conteúdo gástrico durante o vômito
6- Limpar o nariz e identificar a narina mais patente Lavar o nariz e a narina com água (Saskatoon Health Region, 2017)	Facilita a inserção do tubo
7- Fornecer bacia para emese e lenços de papel	Facilita em caso de vômitos
8- Colocar resguardo descartável sobre o tórax	Protege em caso de vômitos
9- Calçar luvas	Protege o profissional da exposição a sangue ou fluidos corporais
10- Medir o comprimento da sonda a ser inserido (nariz/orelha/processo xifóide), (ACSS, 2011; Saskatoon Health Region, 2017), e marcar a sonda com essa medição (Saskatoon Health Region, 2017; Potter, Perry, 2006)	Determina o comprimento do tubo a ser inserido
11- Lubrificar a extremidade da sonda (ACSS, 2011; Saskatoon Health Region, 2017)	Minimiza o trauma

Intervenções de enfermagem	Justificativa
<p>12- Inserir cuidadosamente a sonda dentro da narina dirigindo-a para baixo e para trás em direção à orelha (Saskatoon Health Region, 2017). Instruir o doente para estender o pescoço para trás até a sonda ter passado a nasofaringe. Permitir que o doente relaxe (Saskatoon Health Region, 2017; Potter, Perry, 2006). Instruir o doente para fletir a cabeça para a frente, tomar um pequeno gole de água e engolir até que a sonda esteja totalmente inserida (até ao comprimento marcado) (ACSS, 2011; Saskatoon Health Region, 2017). Insistir na necessidade de respirar pela boca e engolir (Potter, Perry, 2006)</p> <p>Interromper o procedimento e retirar a sonda se houver sinais de perigo durante a inserção, tais como tosse, respiração ofegante, cianose e incapacidade de falar (Taylor, Lillis, &amp; LeMone, 2007) ou se houver vapor de água dentro da sonda.</p> <p>Aguardar alguns minutos antes de continuar a entubação traqueal</p>	<p>Facilita a inserção da sonda</p> <p>Evita complicações</p>
<p>13- Aspirar o conteúdo gástrico e testar o pH <math>\leq</math> 5,5 (Saskatoon Health Region, 2017)</p> <p>Na ausência do conteúdo estomacal, injetar 15 a 20cc de ar, auscultando sons intestinais na região epigástrica. (ACSS, 2011; Saskatoon Health Region, 2017)</p> <p>Pode-se solicitar um Raio-X para confirmar a colocação (Saskatoon Health Region, 2017)</p>	<p>Permite verificar o posicionamento da sonda no estômago e a sua permeabilidade</p> <p>Reduz a incerteza e permite determinar a colocação da sonda</p>
<p>14- Prender a extremidade da sonda ou ligue ao saco de drenagem ou aspiração de baixa pressão dependendo da finalidade da entubação</p>	<p>Evita a entrada de ar e o refluxo de conteúdo gástrico ou promove a drenagem ou aspiração passiva</p>
<p>15- Limpar a pele em redor do nariz, se necessário</p>	<p>Facilita a fixação da sonda</p>
<p>16- Fixar firmemente a sonda ao adesivo do nariz, evitando aplicar pressão</p>	<p>Evita o deslocamento da sonda e facilita a mobilidade no leito</p> <p>Evita a irritação e/ou lesão da pele</p>
<p>17- Limpar o nariz e proporcionar cuidados orais</p>	
<p>18- Posicionar o doente</p>	
<p>19- Descalçar as luvas</p>	
<p>20- Avaliar o estado do doente</p>	
<p>21- Recolher e lavar o material</p>	
<p>22- Higienizar as mãos</p>	<p>Evita a contaminação cruzada</p>

Intervenções de enfermagem	Justificativa
<p>Documentação:</p> <p>É importante manter os seguintes registos (ACSS, 2011; Saskatoon Health Region 2017):</p> <ul style="list-style-type: none"> <li>- Data e hora da inserção de sonda</li> <li>- Tipo e tamanho da sonda</li> <li>- Cor e quantidade de conteúdo gástrico aspirado</li> <li>- Leitura de pH e confirmação de colocação de sonda através de Raio-X, se prescritos</li> <li>- Diagnóstico e intervenções de enfermagem e resultados obtidos</li> <li>- Se a sonda foi clampada, em drenagem ou para irrigação</li> <li>- Educação para a saúde</li> <li>- Nome da pessoa que realizou o procedimento</li> </ul>	<p>Permite a continuidade dos cuidados</p>

Para além destas intervenções, também é importante monitorizar a sonda (posicionamento, dobragem e obstrução), bem como irrigá-la, se necessário, lubrifique a mucosa nasal e providencie higiene oral regular ao doente.

## 5. Possíveis complicações e/ou aspetos a ter em consideração

Quanto a potenciais complicações, a inserção de SNG é um processo que implica alguns riscos, incluindo perfuração esofágica, aspiração, formação de fístulas e enrolamento da sonda. Outro risco associado a este procedimento é a colocação involuntária da sonda na traqueia, o que pode levar a complicações graves tais como lesão pleural, pneumotórax, aspiração traqueobrônquica, pneumonia e morte, se líquidos ou outros agentes forem infundidos (Saskatoon Health Region, 2017).

De acordo com a ACSS (2011), úlcera nas narinas, sinusite, úlcera gástrica e vômitos são outras complicações associadas com a presença prolongada de uma SNG.

## Referências Bibliográficas

ACSS Administração Central do Sistema de Saúde, IP (2011). Manual de Normas de Enfermagem Procedimentos Técnicos. 2ª Edição Revista. Retrieved from <http://forumenfermagem.org/dossier-tecnico/documentos/orientacoes-tecnicas/manual-de-procedimentos-tecnicos-de-enfermagem-acss#.WmcsGahl9PYY>

Ministry of Health. (2010). Moh Nursing Clinical Practice Guidelines 1/2010: Nursing Management of Nasogastric Tube Feeding in Adult Patients. Singapore. Retrieved from [https://www.moh.gov.sg/content/dam/moh\\_web/HPP/Nurses/cpg\\_nursing/2010/nasogastric%20tube%20feeding%20-%20book.pdf](https://www.moh.gov.sg/content/dam/moh_web/HPP/Nurses/cpg_nursing/2010/nasogastric%20tube%20feeding%20-%20book.pdf)

Potter, P.A. & Perry, A.G. (2006). Fundamentos de enfermagem: conceitos e procedimentos (5ªed.). Loures, Portugal: Lusociência.

Saskatoon Health Region, Saskatoon Health Region Nursing Practice Committee, & Interprofessional NG Tube Safety Working Group. (2017). Nasogastric/orogastric tube: insertion, care of, and removal: Adult. Saskatoon, Canada. Retrieved from <https://www.saskatoonhealthregion.ca/about/NursingManual/1040.pdf>

Taylor, C.; Lillis, C. & LeMone, P. (2007). Fundamentos de enfermagem. A arte e a ciencia do cuidado de enfermagem (5aed.). Porto Alegre, Brasil: Artmed.

# Procedure in Nederlands: Nasogastrische Intubatie

---

## 1. Definitie van de procedure

De nasogastrische intubatie (NGI) is een verpleegkundige handeling die uitgevoerd wordt na medisch voorschrift en dit volgens protocol en/of guideline. Bij deze handeling wordt een katheter door de neus tot in de maag ingebracht (ACSS 2011).

## 2. Therapeutische Stappenplan voor deze procedure

Volgens de bronnen die hierboven vermeld staan, kan de nasogastrische intubatie zowel gebruikt worden voor therapeutische als voor diagnostische doeleinden.

**Therapeutische doelen kunnen zijn:**

- Beperken van misselijkheid en braken
- Verminderen van de abdominale druk
- Medicatie of enterale voeding toedienen
- Zorgvragers voorbereiden op een aanvullend onderzoek of chirurgische procedures
- Verwijderen van toxische stoffen of bloed uit de maag

Volgens het Saskatoon Health Region (2017) manual, kan nasogastrische intubatie ook gebruikt worden om vloeistoffen of gassen te verwijderen uit het maagdarmstelsel, als behandeling bij gastrointestinale immobiliteit en darmobstructies en kan dit eveneens worden toegepast om de maag te ledigen en/of te spoelen in geval van een overdosis aan geneesmiddelen of vergiftiging.

Nasogastrische intubatie wordt uitgevoerd om diagnostische redenen door het aspireren van maagvocht voor analyse.

**Contraindicaties:**

De plaatsing van een gastrointestinale katheter is tegenaangewezen in geval de zorgvrager een schedelbreuk, ernstige aangezichtstrauma, zeker ook bij zorgvragers met een nasale en oesofagale obstructie, slokdarmvarices, luchtwegobstructies en stollingsproblemen.

## 3. Materiaal

Volgens eerder onderzoek (Potter & Perry, 2006; ACSS, 2011; Saskatoon Health Region, 2017), is volgend materiaal noodzakelijk om de procedure uit te voeren:

- Werkblad;
- Maagkatheter (type en maat aangepast aan de klinische situatie - 8 of 14 Fr voor volwassenen);
- Glijmiddel op waterbasis;
- Lokaal anestheticum;
- Bedbescherming;
- Glas water eventueel met ijsschilfers;
- Niet steriele handschoenen;
- Masker eventueel met bescherming voor ogen;
- Tongspatel;
- Papieren zakdoekjes;
- Nierbekken;
- Materiaal om de katheter te fixeren;
- pH indicator strips;
- Spuit van 50-60ml met aansluiting voor de kathetertip;
- Maagzakje;
- Container voor medisch afval;
- Aspiratietoestel (lage druk).

#### 4. Stappenplan

Moet de maat van de nasogastrische katheter gekozen worden afhankelijk van het doel van de procedure en de gezondheidstoestand van de zorgvrager en dit met respect voor hun privacy.

##### **Procedure:**

Voor wat de procedure betreft, deze moet worden uitgevoerd met een nette techniek en zachte bewegingen. Volgens Taylor, Lillis, en LeMone (2007), moet de procedure worden stopgezet en de nasogastrische katheter verwijderd worden wanneer er tekens van stress optreden bij het inbrengen van de katheter zoals hoesten, hijgen, cyanose en onmogelijkheid om te spreken of wanneer waterdamp zichtbaar is in de katheter. De zorgverlener moet dan enkele minuten wachten alvorens de procedure verder te zetten.

Op basis van een review van de literatuur werden de verschillende stappen beschreven (Tabel 1).

Tabel 1 – Stappenplan procedure

Verpleegkundige handelingen	Rationale
1- Vergewis je van de noodzaak van de nasogastrische katheter (aspiratie, decompressie of voeding)	
2- Zorg voor privacy (Saskatoon Health Region 2017) Breng het materiaal naar de zorgvrager (ACSS, 2011)	Tijdswinst
3- Voer handhygiëne uit	Voorkom contaminatie
4- Identificeer de zorgvrager Leg het verloop van de procedure uit aan de zorgvrager Vraag toestemming (Saskatoon Health Region 2017) Spreek met de zorgvrager een teken af waarmee hij kan aangeven wanneer hij kan aangeven wanneer hij zich onwel voelt of het gevoel heeft te stikken (Potter, Perry, 2006).	Verkrijg de medewerking van de zorgvrager en verminder de angst bij de zorgvrager
5- Indien mogelijk, breng je de zorgvrager in Fowler of semi-Fowler's houding (ACSS, 2011; Saskatoon Health Region 2017; Potter, Perry, 2006)	Vergemakkelijk de procedure Voorkom het aspireren van maaginhoud wanneer de zorgvrager braakt
6- Reinig de neus en kies het best geschikte neusgat Was de neus en het neusgat met water en zeep (Saskatoon Health Region 2017)	Vergemakkelijk het inbrengen van de katheter
7- Voorzie papieren zakdoeken en een nierbekken	Nodig in geval van braken
8- Leg bed bescherming op de thorax van de zorgvrager	Beschermt in geval van braken
9- Trek handschoenen aan	Beschermt de zorgverlener bij blootstelling aan bloed en ander lichaamsvocht
10- Meet de lengte van de katheter die ingebracht moet worden (neus/oorlel/distaal gedeelte van het xiphoid) (ACSS, 2011; Saskatoon Health Region 2017) en markeer deze lengte op de katheter (Saskatoon Health Region 2017; Potter, Perry, 2006)	Bepaal de lengte die ingebracht moet worden
11- Breng glijmiddel aan op het einde van de katheter (ACSS, 2011; Saskatoon Health Region 2017)	Minimaliseer de kans op een trauma
12- Breng de katheter voorzichtig in het neusgat in neerwaartse en achterwaartse richting naar het oor toe (Saskatoon Health Region 2017). Vraag de	Vergemakkelijk het inbrengen van de katheter



Verpleegkundige handelingen	Rationale
<p>zorgvrager om het hoofd naar achter te buigen tot wanneer de katheter voorbij de nasopharynx is geschoven. Laat de zorgvrager ontspannen (Saskatoon Health Region 2017; Potter, Perry, 2006). Laat de zorgvrager het hoofd naar voor buigen, een slokje water drinken en doorslikken tot de katheter volledig is ingebracht (tot de aangegeven diepte) (ACSS, 2011; Saskatoon Health Region 2017). Stimuleer de zorgvrager om te ademen door de mond en te slikken (Potter, Perry, 2006)</p> <p>Stop de procedure en verwijder de katheter wanneer er tekenen van stress optreden zoals hoesten, hijgen, cyanose en onmogelijkheid om te spreken (Taylor, Lillis, &amp; LeMone, 2007) of wanneer waterdamp in de katheter zichtbaar is.</p> <p>Wacht enkele minute voor het verderzetten van de procedure</p>	<p>Voorkom complicaties</p>
<p>13- Aspireer de maaginhoud en test de PH <math>\leq</math> 5.5 (Saskatoon Health Region 2017)</p> <p>Indien geen maaginhoud geaspireerd kan worden, injecteer je 15 tot 20 ml lucht terwijl je ausculteert om darmgeluiden te horen in de epigastrisch gebied (ACSS, 2011; Saskatoon Health Region 2017)</p> <p>Een RX kan uitgevoerd worden om een juiste positie te bevestigen (Saskatoon Health Region 2017)</p>	<p>Geeft informatie of de katheter in de maag geplaatst is en doorgankelijk is</p> <p>Maakt het mogelijk om met zekerheid te bepalen waar de katheter zich bevindt</p>
<p>14- Klem het uiteinde van de katheter af of bevestig dit aan een opvangzakje of aspiratietoestel, afhankelijk van het doel van de procedure</p>	<p>Voorkom inlaat van lucht en reflux van maaginhoud en maak passieve drainage of aspiratie mogelijk</p>
<p>15- Reinig indien nodig de huid rond de neus</p>	<p>Vergemakkelijkt de bevestiging van de katheter</p>
<p>16- Bevestig de katheter veilig op de kleefband waarbij je druk voorkomt</p>	<p>Voorkom dislocatie van de catheter en bevorder bewegingsvrijheid in bed. Voorkom huidirritatie en/of laesies</p>
<p>17- Reinig de neus en voorzie mondzorg</p>	
<p>18- Positioneer de zorgvrager</p>	
<p>19- Verwijder de handschoenen</p>	
<p>20- Evalueer de toestand van de zorgvrager</p>	
<p>21- Ruim het materiaal op en reinig het</p>	
<p>22- Voer handhygiëne uit</p>	<p>Voorkom cross-contaminatie</p>

Verpleegkundige handelingen	Rationale
Registratie van de gegevens: Het is belangrijk om volgende items te registreren (ACSS, 2011; Saskatoon Health Region 2017): <ul style="list-style-type: none"> <li>- Datum en tijdstip van katheterisatie;</li> <li>- Type en maat van de katheter;</li> <li>- Kleur en hoeveelheid maagvocht dat geaspireerd werd;</li> <li>- pH waarde en bevestiging van de correcte positionering aan de hand van RX, wanneer deze werd voorgeschreven;</li> <li>- Verpleegkundige diagnoses en interventies en bereikte resultaat;</li> <li>- Werd de katheter afgeklemd, geaspireerd of gedraineerd?</li> <li>- Educatie</li> <li>- Naam van de persoon die de handeling heeft uitgevoerd</li> </ul>	Bevorder continuïteit van de zorg

Aanvullend aan deze interventies is het belangrijk om de katheter te observeren (positie, plooi en obstructie), door te spoelen, wanneer nodig, het neusslijmvlies te bevochtigen en mondzorgen toe te passen bij de zorgvrager.

## 5. Potentiële complicaties

Bij het plaatsen van de nasogastrische katheter houdt risico's in. Mogelijke complicaties van de NGI kunnen zijn: oesofagale perforatie, aspiratie, vorming van een fistel, knoopvorming van de katheter. Een ander risico verbonden aan deze procedure is de onopzettelijke plaatsing van de katheter in de trachea, wat kan leiden tot ernstige complicaties zoals beschadiging van de pleura, pneumothorax, trachea-bronchiale aspiratie, pneumonie en overlijden wanneer vocht of andere stoffen worden toegediend (Saskatoon Health Region 2017).

Volgens de ACSS (2011), ulcera aan het neusgat, sinusitis, maagzweer en braken zijn andere complicaties die samenhangen met de langdurige aanwezigheid van de NGI.

## Referenties

ACSS Administração Central do Sistema de Saúde, IP (2011). Manual de Normas de Enfermagem Procedimentos Técnicos. 2ª Edição Revista. Retrieved from <http://forumenfermagem.org/dossier-tecnico/documentos/orientacoes-tecnicas/manual-de-procedimentos-tecnicos-de-enfermagem-acss#.WmcsGahl9PYY>

Ministry of Health. (2010). Moh Nursing Clinical Practice Guidelines 1/2010: Nursing Management of Nasogastric Tube Feeding in Adult Patients. Singapore. Retrieved from

[https://www.moh.gov.sg/content/dam/moh\\_web/HPP/Nurses/cpg\\_nursing/2010/nasogastric%20tube%20feeding%20-%20book.pdf](https://www.moh.gov.sg/content/dam/moh_web/HPP/Nurses/cpg_nursing/2010/nasogastric%20tube%20feeding%20-%20book.pdf)

Potter, P.A. & Perry, A.G. (2006). Fundamentos de enfermagem: conceitos e procedimentos (5ªed.). Loures, Portugal: Lusociência.

Saskatoon Health Region, Saskatoon Health Region Nursing Practice Committee, & Interprofessional NG Tube Safety Working Group. (2017). Nasogastric/orogastric tube: insertion, care of, and removal: Adult. Saskatoon, Canada. Retrieved from <https://www.saskatoonhealthregion.ca/about/NursingManual/1040.pdf>

Taylor, C.; Lillis, C. & LeMone, P. (2007). Fundamentos de enfermagem. A arte e a ciencia do cuidado de enfermagem (5aed.). Porto Alegre, Brasil: Artmed.

## CHAPTER 6

# Suctioning Via a Tracheostomy Tube

---

*Verónica Rita Dias Coutinho, Maria da Conceição Giestas Baía Saraiva, Luís  
Leitão Sarnadas & Rui Carlos Negrão Baptista*

# Procedure in English: Suctioning Via a Tracheostomy Tube

---

## 1. Definition of procedure

It consists of removing tracheobronchial secretions (ACSS, 2011).

### Objectives:

- To maintain airway permeability, prevent secretion stasis, and provide adequate ventilation
- To maintain a patent airway and facilitate respiratory function (Fitzgerald, 2012)

## 2. Therapeutic indications and Contraindications

### Indications:

- Presence of secretions in the upper respiratory tract (O'Donnell & Tiernan, 2016)
- Removal of excessive secretions
- Difficulty in ventilation
- Decreased oxygen level due to rales, rhonchi or bronchial breath sounds
- Arterial oxygen desaturation
- Respiratory disorder

### Contraindications:

Absolute: None

Relative:

- Severe bronchospasm
- Persistent elevated intracranial pressure

## 3. Materials

- Personal protective equipment: an apron, sterile and non-sterile gloves, and protective glasses
- A suction unit, a collection container and tubing (suction system)
- A selection of suction catheters
- A clinical waste bag

The professional should check that the suction unit is in working order and set at the correct suction pressure

#### 4. Stages of the procedure

- Assess the need for suctioning:

This nursing procedure should be performed only when necessary, rather than routinely. The guidelines for its performance should be followed to reduce the risk of infection.

Suctioning should only be performed when there are signs of airway secretions (e.g. visible secretions in the endotracheal tube or tracheostomy) and sounds suggesting the presence of airway secretions on chest auscultation because it is an invasive, irritating, and uncomfortable procedure for patients (Ribeiro, Anjos & Oliveira, 2016).

- Ensure all the equipment required for the procedure is present: To ensure procedure is carried out without interruption
- Wash hands before suctioning. (To ensure asepsis and minimize cross-infection)
- Explain the procedure to the patient. (To minimize anxiety, obtain consent, and enhance cooperation)
- Place the patient in semi-Fowler's position (30-45°) and provide privacy. (To improve respiratory mechanics (Southern Health, 2017) and maintain the patient's privacy and dignity)
- Turn on the suction unit – use minimum pressure required to clear secretions without exceeding the value 150 mmHg or 20 kPa (Ter Haar, 2017). (To ensure that the equipment is working)

Minimal pressure will reduce the risk of the mucosa being damaged. If secretions are tenacious, use a larger suction catheter rather than increasing the pressure above 20 kPa (150 mmHg). An instillation can help inject 10cc of saline in the tube and aspirate it again (Ter Haar, 2017)

Suctioning should not exceed more than 15 seconds. (Credland, 2016)

- Select appropriate size suction catheter – not more than half the diameter of the tracheostomy tube
- Open the suction catheter packaging and attach the suction catheter end to the suction tubing, ensuring the catheter remains in its sterile packaging
- Turn on the suction unit and re-check the unit is at a pressure of 100-150 mmHg.
- Put a sterile glove on the dominant hand. (To minimize infections)

- Remove the catheter from the packaging, ensuring it remains sterile
- Displace the patient's oxygen mask (if present) to allow access to the tracheostomy tube
- Advance the suction catheter into the tracheostomy tube until resistance is felt (when it reaches the carina). Before applying the suction, slowly and smoothly withdraw the catheter by 1-2 cm. (To minimize the risk of damage to the mucosa.). Hypoxia can occur if the suction procedure is prolonged
- Apply suction by occluding the suction port located at the proximal end of the catheter. Suction should be applied continuously rather than intermittently
- Maintain asepsis during the suctioning procedure
- Withdraw the suction catheter slowly with a circular movement and maintain suction. This should be a smooth withdrawal and take no longer than 15 seconds
- Dispose of the suction catheter (wrap the used catheter around your hand and pull off the top glove over the dirty catheter) in a clinical waste bag. Dispose of any personal protective equipment. (To control infection and increase individual protection)
- Replace the patient's oxygen mask. (To ensure patient safety and comfort)
- Flush the suction tubing with 0.9% saline or distilled water. (To ensure patency is maintained for next use)
- In the open-suction system, use a sterile single-use catheter
- In the closed-section system, change the catheter when it is visibly soiled or malfunctioning
- Repeat the procedure until the patient is comfortable and breathing normally. To maintain patient comfort and safety
- Assess the effectiveness of the procedure by observing the patient's respiratory rate and oxygen saturation. If a further suction attempt is required, a new suction catheter and a new sterile glove should be used. Observe the patient for approximately 15 minutes following the procedure. (To maintain patient safety and identify any changes)
- Document the procedure in the patient's records. (To ensure continuity of care, it is essential to keep clear and concise records)

## 5. Potential complications and/or aspects to take into account

An incorrect procedure can entail serious risks and complications for the patient, including increased blood pressure and intracranial pressure, hypoxemia, cardiac arrhythmias, cardiac or respiratory arrest, bronchospasm, atelectasis, nosocomial infections... (Frota, Loureiro & Ferreira, 2014).

Patient agitation, mucosal injury, bleeding, infection/tracheitis (Greenwood & Winters, 2018).

## References

ACSS Administração Central do Sistema de Saúde, IP (2011). Manual de Normas de Enfermagem Procedimentos Técnicos. 2ª Edição Revista. Retrieved from <http://forumenfermagem.org/dossier-tecnico/documentos/orientacoes-tecnicas/manual-de-procedimentos-tecnicos-de-enfermagem-acss#.WmcsGahl9PY>

Credland, N. (2016). How to suction via a tracheostomy. *Art & Science Clinical Skills*, 30(28), 36-38.

Fitzgerald, C. (2012). Guideline for suctioning via a tracheostomy tube. The North West London Hospitals NHS. Retrieved from [https://www.londonccn.nhs.uk/\\_store/documents/guideline\\_for\\_suctioning\\_via\\_a\\_tracheostomy\\_tube.pdf](https://www.londonccn.nhs.uk/_store/documents/guideline_for_suctioning_via_a_tracheostomy_tube.pdf)

Frota, O.; Loureiro, M. & Ferreira, A. (2014). Open system endotracheal suctioning: practices of intensive care nursing professionals. *Escola Anna Nery Revista de Enfermagem*, 18(2), 296-302. Doi: 10.5935/1414-8145.20140043.

Greenwood, J. & Winters, M. (2018). Tracheostomy Care. In Roberts, J.; Custalow, C. & Thomson, T. Roberts and Hedges' *Clinical Procedures in Emergency Medicine and Acute Care*. Seven Edition. Elsevier.

O'Donnell, L. & Tiernan, E. (2016). Guideline on suctioning via an endotracheal tube. Nurse Practice Committee. Retrieved from <http://www.olchc.ie/Healthcare-Professionals/Nursing-Practice-Guidelines/Suctioning-via-Endotracheal-Tube-2016.pdf>

Ribeiro, K.; Anjos, E. & Oliveira, E. (2016). Enfermagem em ventilação mecânica: cuidados na prevenção de pneumonia. *Revista Científica de Enfermagem*, 6 (16), 57-71.

Southern Health NHS CP 214 (2017)- Tracheostomy care guidelines. Version: 1. Retrieved from [file:///C:/Users/ruibatista/Downloads/Tracheostomy%20Care%20Guidelines%20\(1\).pdf](file:///C:/Users/ruibatista/Downloads/Tracheostomy%20Care%20Guidelines%20(1).pdf)



# Procedure in Spanish: Aspiración de secreciones por canúla de traqueostomía

---

## 1. Definición del procedimiento

Consiste en la eliminación de las secreciones traqueobronquiales (ACSS, 2011).

### Objetivos:

- Mantener la permeabilidad de la vía aérea, evitar el éstasis de secreciones y proporcionar una ventilación adecuada
- Mantener la vía aérea permeable y facilitar la función respiratoria (Fitzgerald, 2012)

## 2. Indicaciones terapéuticas y contraindicaciones

### Indicaciones:

- Presencia de secreciones en el tracto respiratorio superior (O'Donnell y Tiernan, 2016)
- Eliminación del exceso de secreciones
- Dificultad en la ventilación
- Disminución del nivel de oxígeno debido a estertores, ronquidos o ruidos respiratorios bronquiales
- Desaturación de oxígeno arterial
- Trastorno respiratorio

### Contraindicaciones:

Absolutas: Ninguna

Relativas:

- Broncoespasmo severo
- Presión intracraneal elevada persistente

## 3. Materiales

- Equipo de protección personal: delantal, guantes estériles y no estériles, y gafas protectoras
- Un sistema de aspiración o aspirador portátil
- Una selección de sondas de aspiración
- Una bolsa de residuos clínicos

El profesional debe verificar que la unidad de aspiración esté funcionando correctamente y ajustada a la presión de aspiración correcta.

#### 4. Pasos del procedimiento

- **Evalue la necesidad de aspiración:**  
Este procedimiento de enfermería debe realizarse sólo cuando sea necesario, y no de forma rutinaria. Las directrices para su realización deben ser seguidas para reducir así el riesgo de infección. La aspiración sólo debe realizarse cuando hay señales de secreciones en las vías respiratorias (por ejemplo, secreciones visibles en el tubo endotraqueal o traqueotomía), y/o sonidos que sugieran la presencia de secreciones durante la auscultación pulmonar, ya que es un procedimiento invasivo, irritante, e incómodo para los pacientes (Ribeiro, Anjos y Oliveira, 2016)
- Asegúrese de que todo el equipo requerido para el procedimiento esté presente, para conseguir que el procedimiento se lleve a cabo sin interrupción
- Lavado de manos antes de succionar, para garantizar la asepsia y minimizar la infección cruzada
- Explique el procedimiento al paciente, para minimizar la ansiedad, obtener su consentimiento, y mejorar la cooperación
- Coloque al paciente en posición de semi-Fowler (30-45°), para mejorar la mecánica respiratoria (Salud del Sur, 2017), y mantener la privacidad y la dignidad del paciente
- Encienda la unidad de aspiración: use la presión mínima requerida para eliminar las secreciones sin exceder el valor de 150 mmHg o 20 kPa (Ter Haar, 2017), para asegurar que el equipo esté funcionando. Una presión mínima reducirá el riesgo de que la mucosa se dañe. Si las secreciones son persistentes, use un catéter de succión más grande en lugar de aumentar la presión por encima de 20 kPa (150 mmHg). Puede ayudar una instilación de 10 cc de solución salina en el tubo y aspirarlo nuevamente (Ter Haar, 2017). La succión no debe exceder más de 15 segundos (Credland, 2016)
- Seleccione un tamaño adecuado de la sonda de aspiración: no más de la mitad del diámetro del tubo de traqueotomía
- Abra el envase de la sonda de aspiración y una el extremo al tubo de succión, asegurando que la sonda permanezca en su embalaje estéril
- Encienda la unidad de aspiración y vuelva a comprobar que la unidad está a una presión de 100-150 mmHg.
- Coloque un guante estéril en la mano dominante, para minimizar el riesgo de infección

- Retire el catéter del envase, asegurando que permanezca estéril
- Retire la máscara de oxígeno del paciente (si está presente), para permitir el acceso al tubo de traqueotomía.
- Avance la sonda de aspiración en el tubo de traqueotomía hasta que se note resistencia (cuando llega a la carina). Antes de aplicar la succión, lenta y suavemente, retire el catéter 1-2 cm, para minimizar el riesgo de daño a la mucosa. Puede sobrevenir una hipoxia si se prolonga el procedimiento de aspiración
- Aplique la succión mediante la oclusión de la boca de aspiración situada en el extremo proximal del catéter. La succión debe aplicarse de forma continua en lugar de intermitente
- Mantenga la asepsia durante el procedimiento de aspiración
- Retire el catéter de succión lentamente con un movimiento circular y mantenga la succión. Debe ser una retirada suave y no tiene que durar más de 15 segundos
- Deseche el catéter de succión (envuelva el catéter usado alrededor de su mano y retire el guante sobre el catéter sucio) en una bolsa de residuos clínicos. Deseche el equipo de protección personal, para controlar la infección y aumentar la protección individual
- Recoloque la máscara de oxígeno al paciente, para garantizar la seguridad y comodidad del paciente
- Enjuague el tubo de aspiración con solución salina al 0,9% o agua destilada, para asegurar que se mantiene permeable para el próximo uso
- En sistemas de succión abiertos, use un catéter estéril de un solo uso
- En sistemas de aspiración cerrados, cambie el catéter cuando esté visiblemente sucio o no funcione correctamente
- Repita el procedimiento hasta que el paciente se sienta cómodo y respire normalmente, para mantener la comodidad y seguridad del paciente
- Evalúe la eficacia del procedimiento mediante la observación de la frecuencia respiratoria y la saturación de oxígeno del paciente. Si se requiere un nuevo intento de succión, se debe usar un nuevo catéter de aspiración y un nuevo guante estéril. Observe al paciente durante aproximadamente 15 minutos después del procedimiento, para mantener la seguridad del paciente e identificar cualquier cambio
- Registre el procedimiento en el historial del paciente

## 5. Complicaciones potenciales y/o aspectos a considerar

Un procedimiento incorrecto puede conllevar riesgos y complicaciones graves para el paciente incluyendo: aumento de la presión arterial y la presión intracraneal, hipoxemia, arritmias cardíacas, paro cardíaco o respiratorio, broncoespasmo, atelectasia, infecciones nosocomiales... (Frota, Loureiro y Ferreira, 2014). También agitación, lesión de la mucosa, sangrado y/o traqueítis (Greenwood y Winters, 2018).

## Referencias

- ACSS Administração Central do Sistema de Saúde, IP (2011). Manual de Normas de Enfermagem Procedimentos Técnicos. 2ª Edição Revista. Retrieved from <http://forumenfermagem.org/dossier-tecnico/documentos/orientacoes-tecnicas/manual-de-procedimentos-tecnicos-de-enfermagem-acss>. WmcsGahl9PY
- Credland, N. (2016). How to suction via a tracheostomy. *Art & Science Clinical Skills*, 30(28), 36-38.
- Fitzgerald, C. (2012). Guideline for suctioning via a tracheostomy tube. The North West London Hospitals NHS. Retrieved from [https://www.londonccn.nhs.uk/\\_store/documents/guideline\\_for\\_suctioning\\_via\\_a\\_tracheostomy\\_tube.pdf](https://www.londonccn.nhs.uk/_store/documents/guideline_for_suctioning_via_a_tracheostomy_tube.pdf)
- Frota, O.; Loureiro, M. & Ferreira, A. (2014). Open system endotracheal suctioning: practices of intensive care nursing professionals. *Escola Anna Nery Revista de Enfermagem*, 18(2), 296-302. Doi: 10.5935/1414-8145.20140043.
- Greenwood, J. & Winters, M. (2018). Tracheostomy Care. In Roberts, J.; Custalow, C. & Thomson, T. Roberts and Hedges' *Clinical Procedures in Emergency Medicine and Acute Care*. Seven Edition. Elsevier.
- O'Donnell, L. & Tiernan, E. (2016). Guideline on suctioning via an endotracheal tube. Nurse Practice Committee. Retrieved from <http://www.olchc.ie/Healthcare-Professionals/Nursing-Practice-Guidelines/Suctioning-via-Endotracheal-Tube-2016.pdf>
- Ribeiro, K.; Anjos, E. & Oliveira, E. (2016). Enfermagem em ventilação mecânica: cuidados na prevenção de pneumonia. *Revista Científica de Enfermagem*, 6 (16), 57-71.
- Southern Health NHS CP 214 (2017)- Tracheostomy care guidelines. Version: 1. Retrieved from [file:///C:/Users/ruibatista/Downloads/Tracheostomy%20Care%20Guidelines%20\(1\).pdf](file:///C:/Users/ruibatista/Downloads/Tracheostomy%20Care%20Guidelines%20(1).pdf)

# Procedure in Portuguese: Aspiração de Secreções por Cânula de Traqueostomia

---

## 1. Definição do procedimento

Consiste na remoção de secreções traqueobrônquicas (ACSS, 2011).

### Objetivos:

- Manter a permeabilidade das vias respiratórias, evitar a estase de secreção e fornecer ventilação adequada
- Manter as vias respiratórias patentes e facilitar a função respiratória (Fitzgerald, 2012)

## 2. Indicações terapêuticas e contraindicações

### Indicações:

Presença de secreções do trato respiratório superior (O'Donnell & Tiernan, 2016):

- Remoção do excesso de secreções
- Dificuldade de ventilação
- Diminuição da oxigenação na presença de ralas, roncos ou sons respiratórios tubulares
- Dessaturação de oxigénio arterial
- Distúrbio respiratório

### Contraindicações:

**Absolutas:** Nenhuma

### Relativas:

- Broncospasmo grave
- Pressão intracraniana elevada persistente

## 3. Materiais

- Equipamento de proteção pessoal: um avental, luvas estéreis e não estéreis, e óculos de proteção
- Uma unidade de aspiração, um recipiente de recolha e tubuladura (sistema de aspiração)
- Uma seleção de cateteres de aspiração
- Um saco de resíduos clínicos

O profissional deve verificar se a unidade de aspiração está funcional e ajustá-la na correta pressão de aspiração.

#### 4. Fases do procedimento

- Avalie a necessidade de aspiração:

Este processo de enfermagem deve ser realizado apenas quando necessário, em vez de rotineiramente. As orientações para a sua realização devem ser seguidas para reduzir o risco de infecção.

A aspiração deve ser realizada apenas quando há sinais de secreção das vias respiratórias (por exemplo, secreções visíveis no tubo endotraqueal ou traqueostomia) e sons que sugerem a presença de secreções das vias respiratórias aquando da auscultação torácica, porque é um procedimento invasivo, irritante e desconfortável para os pacientes (Ribeiro, Anjos & Oliveira, 2016).

- Certifique-se de que todos os equipamentos necessários para o procedimento estão presentes. (Para garantir que o procedimento é realizado sem interrupção)
- Lave as mãos antes da aspiração. (Para garantir a assepsia e minimizar a infecção cruzada)
- Explique o procedimento ao doente. (Para minimizar a ansiedade, obter o consentimento e promover a cooperação)
- Coloque o paciente em posição semi-Fowler (ângulo de 30-45°) e proporcione privacidade. (Para melhorar a mecânica respiratória (Southern Health, 2017) e manter a privacidade e a dignidade do doente)
- Ligue a unidade de aspiração – use a pressão mínima necessária para aspirar as secreções sem exceder o valor 150 mmHg ou 20 kPa (Ter Haar, 2017). (Para garantir que o equipamento está a funcionar):

A pressão mínima irá reduzir o risco de as mucosas serem danificadas. Se as secreções forem persistentes, use um cateter de sucção maior em vez de aumentar a pressão acima de 20 kPa (150 mmHg). Uma instilação pode ajudar ao injetar 10cc de solução salina no tubo e aspirá-la novamente (Ter Haar, 2017).

A aspiração não deve exceder mais do que 15 segundos. (Credland, 2016).

- Selecione um cateter de aspiração de tamanho adequado - não mais do que metade do diâmetro do tubo de traqueostomia.

- Abra a embalagem do cateter de aspiração e prenda a extremidade do cateter de aspiração à tubulação de aspiração, garantindo que o cateter permanece na sua embalagem estéril
- Ligue a unidade de aspiração e verifique se a unidade está a uma pressão de 150 mmHg.
- Coloque uma luva estéril na mão dominante. (Para reduzir infeções)
- Retire o cateter da embalagem, garantindo que permanece estéril
- Desloque a máscara de oxigénio do paciente (se houver) para permitir o acesso ao tubo de traqueostomia
- Continue a introduzir o cateter de aspiração no tubo de traqueostomia até sentir resistência (quando alcançar a carina). Antes de começar a aspirar, retire lenta e suavemente o cateter cerca de 1-2 cm. (Para minimizar o risco de danos nas mucosas). A hipoxia pode ocorrer se o procedimento de aspiração for prolongado.
- Aplique sucção ao ocluir o orifício de aspiração localizado na extremidade proximal do cateter. A sucção deve ser aplicada de forma contínua em vez de forma intermitente
- Mantenha a assepsia durante o procedimento de aspiração
- Retire o cateter de aspiração lentamente com um movimento circular e mantenha a sucção. Deve ser retirado num movimento suave e não demorar mais do que 15 segundos
- Descarte a sonda de aspiração após a sua utilização (coloque em volta da mão com a luva e puxe a luva sobre a zona não limpa, envolvendo também o cateter) num saco de resíduos clínicos. Descarte qualquer equipamento de proteção pessoal. (Para controlar a possibilidade de infeção e aumentar a proteção individual)
- Substitua a máscara de oxigénio do doente. (Para garantir a segurança e o conforto do doente)
- Lave o tubo de aspiração com solução salina a 0,9% ou água destilada. Para garantir que se mantém a qualidade patente para a próxima utilização
- No sistema de aspiração aberto, use um cateter estéril descartável
- No sistema de aspiração fechado, altere o cateter quando este está visivelmente sujo ou com defeito
- Repita o procedimento até que o paciente esteja confortável e a respirar normalmente. (Para manter o conforto e segurança do paciente)
- Avalie a eficácia do procedimento ao observar a frequência respiratória e a saturação de oxigénio do doente. Se for necessária uma nova tentativa de aspiração, deve-se usar



um novo cateter de aspiração e uma nova luva estéril. Observe o doente durante aproximadamente 15 minutos após o procedimento. (Para manter a segurança do doente e identificar quaisquer alterações)

- Documente o procedimento nos registos do doente. (Para garantir a continuidade dos cuidados, é essencial manter registos claros e concisos)

## **5. Possíveis complicações e/ou aspetos a ter em conta**

O procedimento incorreto pode acarretar riscos e complicações graves para o doente como aumento da pressão arterial, da pressão intracraniana, hipoxemia, arritmias cardíacas, paragem cardíaca ou respiratória, broncospasmo, atelectasias, infeções nosocomiais.... (Frota, Loureiro & Ferreira, 2014)

Agitação do doente, Lesão da mucosa, Hemorragias Infeção / traqueíte (Greenwood & Winters, 2018)

## Referências Bibliográficas

- ACSS Administração Central do Sistema de Saúde, IP (2011). Manual de Normas de Enfermagem Procedimentos Técnicos. 2ª Edição Revista. Retrieved from <http://forumenfermagem.org/dossier-tecnico/documentos/orientacoes-tecnicas/manual-de-procedimentos-tecnicos-de-enfermagem-acss#.WmcsGahI9PY>
- Credland, N. (2016). How to suction via a tracheostomy. *Art & Science Clinical Skills*, 30(28), 36-38.
- Fitzgerald, C. (2012). Guideline for suctioning via a tracheostomy tube. The North West London Hospitals NHS. Retrieved from [https://www.londonccn.nhs.uk/\\_store/documents/guideline\\_for\\_suctioning\\_via\\_a\\_tracheostomy\\_tube.pdf](https://www.londonccn.nhs.uk/_store/documents/guideline_for_suctioning_via_a_tracheostomy_tube.pdf)
- Frota, O.; Loureiro, M. & Ferreira, A. (2014). Open system endotracheal suctioning: practices of intensive care nursing professionals. *Escola Anna Nery Revista de Enfermagem*, 18(2), 296-302. Doi: 10.5935/1414-8145.20140043.
- Greenwood, J. & Winters, M. (2018). Tracheostomy Care. In Roberts, J.; Custalow, C. & Thomson, T. Roberts and Hedges' *Clinical Procedures in Emergency Medicine and Acute Care*. Seven Edition. Elsevier.
- O'Donnell, L. & Tiernan, E. (2016). Guideline on suctioning via an endotracheal tube. Nurse Practice Committee. Retrieved from <http://www.olchc.ie/Healthcare-Professionals/Nursing-Practice-Guidelines/Suctioning-via-Endotracheal-Tube-2016.pdf>
- Ribeiro, K.; Anjos, E. & Oliveira, E. (2016). Enfermagem em ventilação mecânica: cuidados na prevenção de pneumonia. *Revista Científica de Enfermagem*, 6 (16), 57-71.
- Southern Health NHS CP 214 (2017)- Tracheostomy care guidelines. Version: 1. Retrieved from [file:///C:/Users/ruibatista/Downloads/Tracheostomy%20Care%20Guidelines%20\(1\).pdf](file:///C:/Users/ruibatista/Downloads/Tracheostomy%20Care%20Guidelines%20(1).pdf)

# Procedure in Nederlands: Aspiratie Via Tracheostomie

---

## 1. Definiëring van de procedure

Bij het aspireren via tracheostomie worden trachea-bronchiale secreten verwijderd (ACSS, 2011).

**Doelstelling voor het uitvoeren van deze techniek zijn:**

- Doorgankelijkheid van de luchtweg verzekeren, stase van secreties voorkomen en een adequate ventilatie mogelijk maken.
- Een betrouwbare luchtweg handhaven en de respiratoire functie bevorderen (Fitzgerald, 2012)

## 2. Therapeutische indicaties en contra-indicaties

**Indicaties:**

- Aanwezigheid van secreties in de bovenste luchtwegen (O'Donnell & Tiernan, 2016);
- Verwijderen van overtollige secreties;
- Moeilijkheden tijdens het ademen;
- Verlaagd zuurstofgehalte ten gevolge van crepitaties, rhonchi of bronchiale geluiden;
- Arteriële desaturatie;
- Arterial oxygen desaturation;
- Ademhalingsstoornis.

**Contraindicaties:**

**Absolute:** geen

**Relatieve:**

- Ernstige bronchospasmen;
- Persisterende verhoogde intracraniale druk.

## 3. Materiaal

Persoonlijke beschermingsmaterialen: een schort, steriele en onsteriele handschoenen, beschermingsbril.

- Een aspiratietoestel, opvangrecipiënt en leiding (aspiratiesysteem);

- Een selectie aspiratiekatheters;
- Een afvalzak voor medisch afval.

De zorgverlener moet de werking van het aspiratietoestel controleren en de juiste zuigkracht instellen.

#### 4. Stappenplan voor de procedure (met verantwoording)

- Beoordeel de noodzaak voor aspiratie.

Deze verpleegkundige handeling moet niet routinematig worden uitgevoerd, enkel indien noodzakelijk. De richtlijn voor deze handeling dient gevolgd te worden om het risico op infecties te beperken.

Aspiratie moet enkel uitgevoerd worden als er aanwijzingen dat er luchtwegsecretiesaanwezig zijn (e.g. zichtbare secreties in de endotracheale tube of tracheostomie) en bij auscultatie van de thorax geluiden hoorbaar zijn die wijzen op de aanwezigheid van luchtwegsecreties omdat dit een invasieve, irriterende en oncomfortabele procedure is voor zorgvragers (Ribeiro, Anjos & Oliveira, 2016).

- Zorg ervoor dat al het materiaal dat nodig is voor deze procedure aanwezig is. (Om zeker te zijn dat de procedure zonder onderbreking uitgevoerd kan worden.)
- Was de handen voor het aspireren , dit om aseptisch te werken en de kans op kruisinfecties te minimaliseren.
- Informeer de zorgvrager om angst te beperken, toestemming te verkrijgen en coöperatie te bevorderen.
- Breng de zorgvrager in semi-Fowler's houding (30-45°) en zorg voor privacy. (Om de respiratoire mechanismen te bevorderen (Southern Health, 2017) en de privacy en waardigheid van de zorgvrager te beschermen.)
- Zet het aspiratiesysteem aan, stel de zuigkracht zo laag mogelijk in om de secreties op te zuigen 15-20 kPa (100-150 mmHg) (Ter Haar, 2017). (Controleer of het toestel werkt.) Minimale zuigkracht reduceert het risico op mucosaletsels. In geval van taaie secreties, gebruik je beter een grotere aspiratiekatheter dan de zuigkracht te verhogen boven 20 kPa (150 mmHg) (Ter Haar, 2017).  
Aspireren mag maximaal 15 seconden duren (Credland, 2016).
- Kies een aangepaste maat van aspiratiekatheter – maximum de helft van de diameter van de tracheostomie canule.

- Open de verpakking van de aspiratiekatheter en connecteer deze op de aspiratieslang, zonder de steriele verpakking van de katheter te verwijderen.
- Zet het aspiratiesysteem aan en controleer of de zuigkracht nog steeds 100-150 mmHg bedraagt.
- Trek een steriele handschoen aan over de dominante hand om de kans op infecties te minimaliseren.
- Verwijder de verpakking van de katheter zonder deze te desteriliseren.
- Verwijder het zuurstofmasker wanneer de zorgvrager dit draagt om de tracheostomie toegankelijk te maken.
- Breng de aspiratiekatheter in de tracheostomie canule tot je weerstand voelt (wanneer de tip zich ter hoogte van de carina bevindt). Alvorens te aspireren trek je de katheter voorzichtig 1 tot 2 cm terug. (Om de kans op mucosaletstels te beperken. )  
Hypoxie kan optreden wanneer langdurig geaspireerd wordt.
- Aspireer door de vingertip aan het proximale uiteinde van de katheter af te sluiten. Het is aangeraden om continu te aspireren in plaats van intermitterend.
- Voer deze aspiratieprocedure aseptisch uit .
- Trek de aspiratiekatheter traag terug terwijl je continu aspireert. Dit moet gebeuren in een vlotte beweging en mag maximaal 15 sec duren.
- Werp de aspiratiekatheter weg (draai de katheter rond de dominante hand en trek de handschoen over de gebruikte katheter) in de afvalzak voor medisch afval Verwijder de persoonlijk beschermingsmaterialen. (Om infecties te voorkomen en persoonlijke bescherming te verhogen.)
- Plaats het zuurstofmasker van de zorgvrager terug. (Om de veiligheid en het comfort van de zorgvrager te garanderen.)
- Spoel de aspiratieleiding met NaCl 0,9% of gedistilleerd water. (Om de doorgankelijkheid te handhaven voor een volgend gebruik.)
- Bij gebruik van een open aspiratiesysteem, gebruik je een steriele wegwerpkatheter.
- Bij gebruik van een gesloten aspiratiesysteem, vervang je de aspiratiekatheter wanneer deze zichtbaar bevuild is of slecht functioneert.
- Herhaal deze procedure tot de zorgvrager zich comfortabel voelt en normaal ademt. (Om het comfort en de veiligheid van de zorgvrager te handhaven.)
- Beoordeel het effect van de procedure door de ademhalingsfrequentie en zuurstofsaturatie van de zorgvrager te observeren. Als een nieuwe aspiratiepoging noodzakelijk is, moet een nieuwe aspiratiekatheter en nieuwe steriele handschoen

gebruikt worden. Observeer de zorgvrager na deze procedure gedurende ongeveer 15 minuten. (Om de veiligheid van de zorgvrager te garanderen en veranderingen op te merken.)

- Noteer de procedure in het patiëntendossier. (Om continuïteit van de zorgen te garanderen is het bijhouden van duidelijke en volledige patiëntendossiers noodzakelijk.)

## **5. Potentiële complicaties en/of aspecten waarmee rekening gehouden moet worden (sommige gerelateerd aan anatomische structuren)**

Een foute procedure kan ernstige risico's en complicaties inhouden voor de zorgvrager, zoals verhoogde bloeddruk en verhoogde intracraniale druk, hypoxemie, hartritmestoornissen, hart- of ademhalingsstilstand, bronchospasme, atelectase, nosocomiale infecties,... (Frota, Loureiro & Ferreira, 2014).

Andere potentiële complicaties zijn agitatie, mucosaletsels, bloeding, infectie/tracheïtis (Greenwood & Winters, 2019).

## Referenties

ACSS Administração Central do Sistema de Saúde, IP (2011). Manual de Normas de Enfermagem Procedimentos Técnicos. 2ª Edição Revista. Retrieved from <http://forumenfermagem.org/dossier-tecnico/documentos/orientacoes-tecnicas/manual-de-procedimentos-tecnicos-de-enfermagem-acss#.WmcsGahI9PY>

Credland, N. (2016). How to suction via a tracheostomy. *Art & Science Clinical Skills*, 30(28), 36-38.

Fitzgerald, C. (2012). Guideline for suctioning via a tracheostomy tube. The North West London Hospitals NHS. Retrieved from [https://www.londonccn.nhs.uk/\\_store/documents/guideline\\_for\\_suctioning\\_via\\_a\\_tracheostomy\\_tube.pdf](https://www.londonccn.nhs.uk/_store/documents/guideline_for_suctioning_via_a_tracheostomy_tube.pdf)

Frota, O.; Loureiro, M. & Ferreira, A. (2014). Open system endotracheal suctioning: practices of intensive care nursing professionals. *Escola Anna Nery Revista de Enfermagem*, 18(2), 296-302. Doi: 10.5935/1414-8145.20140043.

Greenwood, J. & Winters, M. (2018). Tracheostomy Care. In Roberts, J.; Custalow, C. & Thomson, T. Roberts and Hedges' *Clinical Procedures in Emergency Medicine and Acute Care*. Seven Edition. Elsevier.

O'Donnell, L. & Tiernan, E. (2016). Guideline on suctioning via an endotracheal tube. Nurse Practice Committee. Retrieved from <http://www.olchc.ie/Healthcare-Professionals/Nursing-Practice-Guidelines/Suctioning-via-Endotracheal-Tube-2016.pdf>

Ribeiro, K.; Anjos, E. & Oliveira, E. (2016). Enfermagem em ventilação mecânica: cuidados na prevenção de pneumonia. *Revista Científica de Enfermagem*, 6 (16), 57-71.

Southern Health NHS CP 214 (2017)- Tracheostomy care guidelines. Version: 1. Retrieved from [file:///C:/Users/ruibatista/Downloads/Tracheostomy%20Care%20Guidelines%20\(1\).pdf](file:///C:/Users/ruibatista/Downloads/Tracheostomy%20Care%20Guidelines%20(1).pdf)

# ANNEX

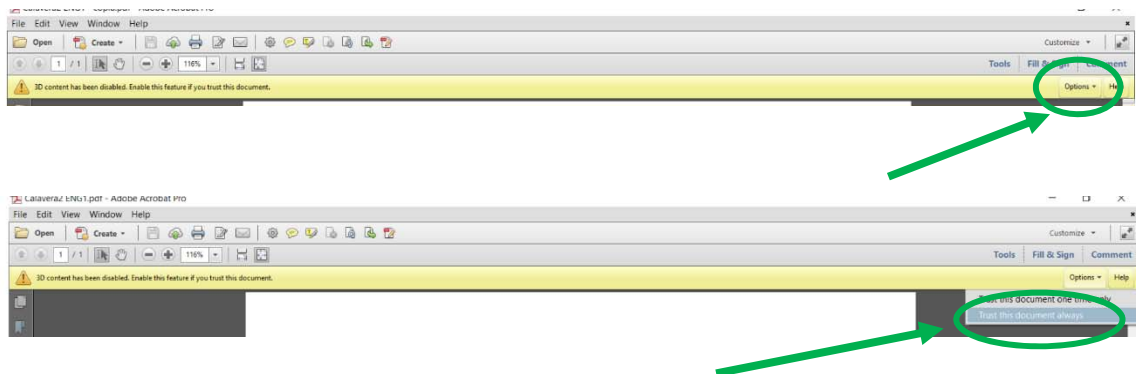
---



## Annex 1: PDF with 3D content- Instructions for use

To use this e-book, you will need a PDF reader program, and in our case, I'd recommend the free version of Adobe Acrobat Reader that allows suitable interaction.

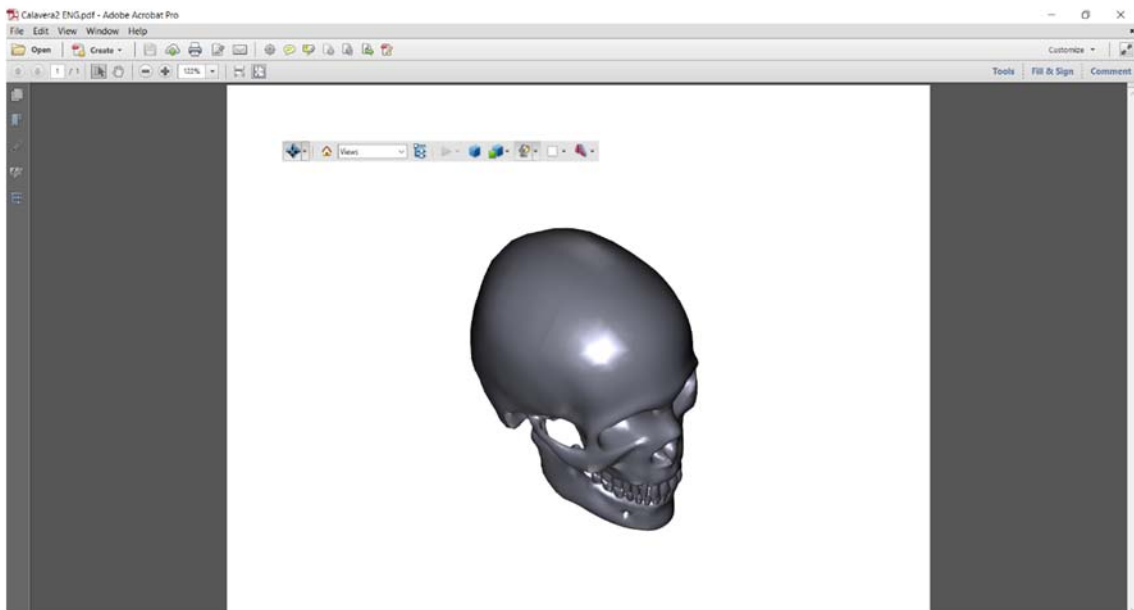
Initially, when you open this PDF document, you might not see the image properly. If you click on an image, a warning message will appear. You must state that you want to enable the 3D content in the document. To do this, press **OPTIONS** and choose **TRUST THIS DOCUMENT ALWAYS**.



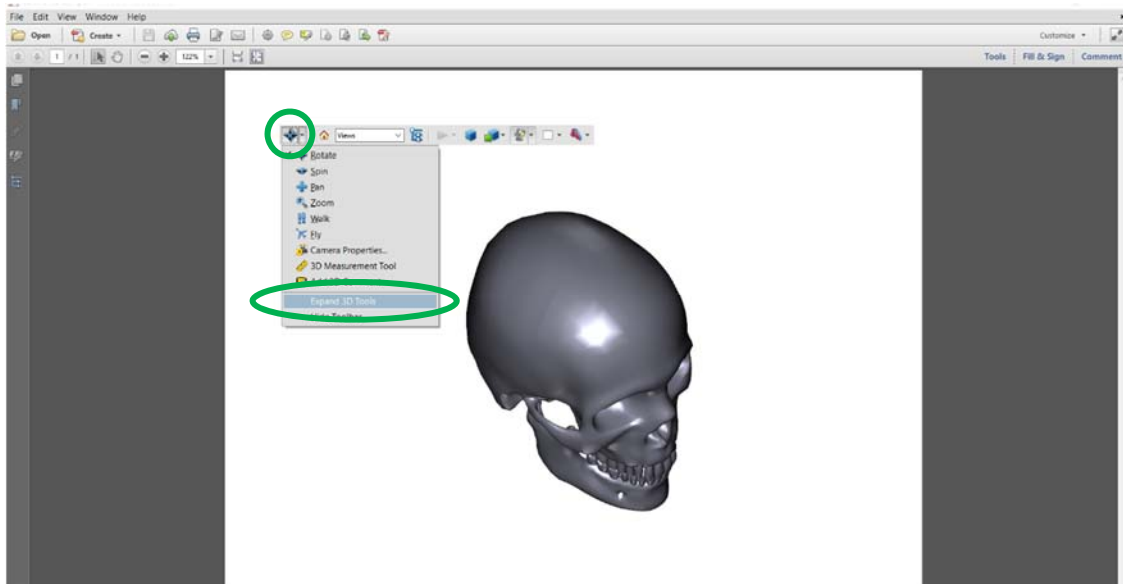
Subsequently, you must activate the 3D drawing by left-clicking on it with the mouse.



The new image will look like this. The toolbar might be different as it is sometimes predefined as a shorter bar.



If the shorter bar appears, you can browse the different options by clicking the arrow in the first icon. For the full bar to appear, choose the “Expand 3D tools” option (you can also compress it again)



Following, we are going to analyse the most important options for the toolbar:



This is the main, predefined view. If you move the image but you are not happy with the look, or if you have added information, just click this icon, and everything will go back to its initial position.

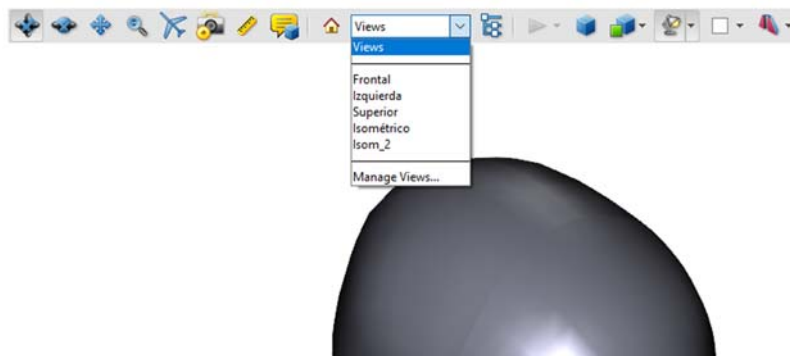


Use this icon to turn the figure freely. To do this, hold down the left-hand mouse button inside the figure and move the mouse around it, so you can see how it moves.

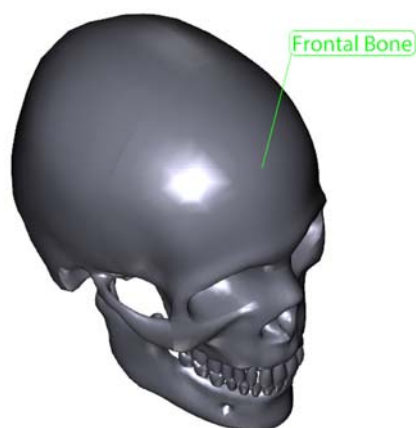


To zoom out of the image, you can use the mouse wheel or this icon.

With regard to the views, the predefined image is always the default view. However, other views are available. Clicking on the dropdown view menu will give you all the options. In general, these views are available.

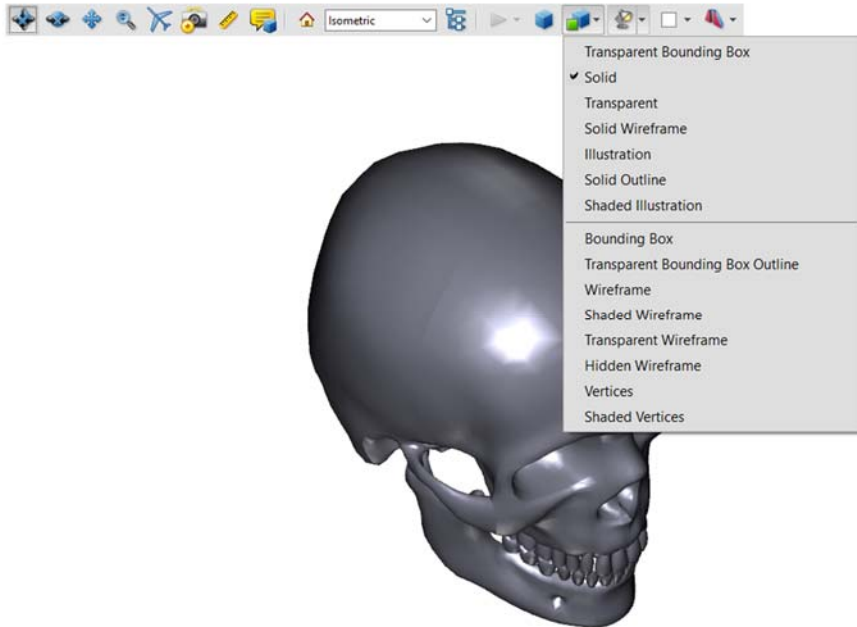


Occasionally, you might get another view (labels), to provide extra information:





If you need to see a hidden side, but don't want to move the part to see the final result, the transparent option is recommended as it shows the hidden edges.



In the next page, the 3D image of the skull is available to allow you to practice the different options.

