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Historical perspective of two technical standards developed in the 21st century that gave rise to profound changes in Peruvian anesthesiology

Perspectiva histórica de dos normas técnicas desarrolladas en el siglo XXI que generaron cambios profundos en la anestesiología peruana

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Abstract

The technical standards in anesthesiology govern the professional practice and allow for the provision of safer anesthesia and surgery. This article gives a historical perspective on the creation, main content, and consequences of the implementation of the Peruvian standards in anesthesiology.

Key words

Anesthesiology; Standard of care; Public Health Surveillance; Public Health; History of medicine; Peru.

Resumen

Las normas técnicas de anestesiología rigen el ejercicio profesional y permiten ofrecer una anestesia y una cirugía más seguras. El presente artículo brinda una perspectiva histórica sobre la creación, el contenido principal y las consecuencias de la implementación de las normas de anestesiología peruanas.

Palabras clave

Anestesiología; Estándar de cuidado; Vigilancia en Salud Pública; Salud Pública; Historia de la medicina; Perú.

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INTRODUCTION

In several South American countries, such as Bolivia, Ecuador, Venezuela, Paraguay, and Peru, anesthesiology was practiced for many years without a legal framework to regulate the professional practice of the specialty, education, and training. In this context, many healthcare providers with low level of training in anesthesia, including surgeons, registered nurses, and even other less skilled providers performed anesthesia procedures during the second half of the 20th century.(1) In a not-so-distant past, these previously described situations were common in Peru. However, since 2005, when the first technical Anesthesiology standard was approved by the Peruvian Health Ministry (PHM), profound changes in professional practice were initiated in all healthcare institutions, whether public, private or mixed, where any procedure of the specialty was performed.(2)

TECHNICAL STANDARDS IN SOUTH AMERICA

In South America, as detailed in Complementary material 1, Uruguay, Colombia, and Argentina have the oldest regulations regarding specialized work in the field of Anesthesiology established during the second half of the 20th century. These standards were developed by both national governments and national scientific societies, and have been updated in various countries over the decades.

It is noteworthy that, as in the case of Colombia, the approach to update its standards on safety in anesthesiology through an initial process of consensus of experts using the modified Delphi method, finally resulted in the submission of the official document for discussion and approval by a national congress session. The described methodology could be used to review and update the Peruvian standards based on the initial revised document prepared by a team of experts from various sectors such as the national society, private and public organizations, and PHM officials.

First Peruvian anesthesia technical standard

In 1999, the Peruvian Society of Anesthesia, Analgesia, and Resuscitation (SPAAR) issued the "Minimum Standards for the Ethical Exercise of Anesthesia, Analgesia, and Resuscitation in Peru" with the purpose of preventing risks to the patient in the operating room. These standards were approved by resolution 1655 of the National Council of the Medical College of Peru. Finally, this document recommended that the standards should be reviewed at least every 3 years by a joint commission including members of the PHM and SPAAR. (3)

In 2004, a technical committee for anesthesia services was created, made up of 13 anesthesiologists from the highest complexity Peruvian hospitals in both the public and private sectors, as well as members of the PHM. This committee drafted a proposal for a technical standard, which was validated by 36 senior anesthesiologists from different Peruvian institutions, including members of the board of directors of the Peruvian Society of Anesthesia, Analgesia, and Resuscitation.(4) Most of the document (except for annexes on reference and counter-reference criteria, flow by levels of care, and continuous medical training for anesthesiologists) became the first Peruvian technical standard approved in 2005. The overall objective of the standard (2) was to ensure optimal patient care in the Anesthesiology services in all of the Peruvian health facilities, through a set of technical and administrative guidelines. The standard provided a detailed regulatory framework for patient care processes according to the level of complexity of the health facility, in order to meet the needs of patients requiring quality anesthesia care. According to the standard, the heads of the anesthesiology services and all the procedures associated with the specialty in every hospital should be under the leadership of a physician anesthesiologist. However, in the case of lower complexity healthcare institutions, such responsibility would be attributed to a physician anesthesiologist or a non-anesthesiologist physician with competencies in the field. The anesthesiologists assigned to attend emergency surgeries in the operating room (OR) would be full-time emergency OR practitioners and were prohibited from participating in simultaneous surgical procedures. The standard defined the roles of the anesthesiologist-in-chief and the staff anesthesiologists, and the requirements for certified and unskilled nursing staff. It also established the number of personnel needed for the different activities in the OR, anesthesia offices, post-anesthesia care unit (PACU), and pain management unit as shown in Table 1. Additional important aspects related to the standard are summarized in Complementary material 2.

Second Peruvian anesthesia technical standard

In 2011, the PHM approved the second technical standard (5) with the following objectives: standardization of care processes in anesthesiology, pain management, and resuscitation; the promotion of the rational use and adequate flow of resources used in anesthesia care; enhanced compliance with safety measures to reduce risks for patients and health care personnel; and, strengthening of anesthesiology education and research competencies.

This document amended the first anesthesia standard. One of the key aspects was the requirement that every anesthesia procedure performed at any healthcare facility, should be conducted by a physician who completed a residency in Anesthesiology. The duration of the Peruvian residency program in Anesthesiology is three years and 2 additional years for sub-specialties such as Cardiovascular and Obstetric Anesthesiology.(6) The standard required

Table 1. Personnel requirements of the Peruvian anesthesiology services.

Staff	Area	Type of shift	
Anesthesiologists	Clinical Surgical Anesthesia	Ordinary Shift	Emergency Shift
	*Anesthesia Office**	*One specialist per shift*	*NA*
	OR	One specialist per OR	One specialist per emergency OR
	PACU	One specialist per shift	One specialist per shift
	Pain Management Unit	*Ordinary shift*	*Emergency shift*
	Pain Management Office	One specialist per shift	NA
	Pain Management Procedures	One specialist per shift	NA
Certified nursing staff	Area	Type of shift	
	Surgical Clinical Anesthesia	*Ordinary shift*	*Emergency Shift*
	OR	One nurse per shift/ OR for administrative work. One or more nurses per OR according to complexity	One or more nurses per OR according to complexity
	PACU	One nurse per shift and every 3 patients	One nurse per shift and every 3 patients
	Pain Management Unit	*Ordinary shift*	*Emergency shift*
	Pain Management Office	One nurse per shift	NA
	Pain Management Procedures	One nurse or more on demand	NA
Unskilled nursing staff	Area	Type of shift	
	Surgical Clinical Anesthesia	*Ordinary Shift*	*Emergency shift*
	OR	One unskilled nurse per shift/OR	One unskilled nurse per emergency shift and one per OR according to the complexity
	PACU	One per shift with 3 patients of high complexity or 6 of low complexity	One per shift with 3 patients of high complexity or 6 of low complexity

NA: Not assigned; OR: Operating room; PACU: Post-anesthesia care unit. * Office assigned for preoperative anesthesia assessment.

Source: Adapted by the authors from (2).

healthcare institutions to adopt clinical practice guidelines that serve as documents for standardizing all anesthetic, pain, and resuscitation procedures. The anesthesia care process was divided into three periods: pre-anesthesia, intraoperative, and post-anesthesia. The standard also classified the professional risks of the personnel working in the Anesthesiology services.(5) The details of both topics are shown in Complementary material 3. This standard provided a list of drugs, including Dantrolene, used in anesthesia care according to the hospital complexity. However, there is currently a shortage of Dantrolene in Peru (7) because the sanitary registration expired (8), and hence its availability is limited to a few public and private institutions. In some facilities, Dantrolene was made available through foreign donations. Consequently, a coordinated action is needed among all the public and private stakeholders involved, to ensure its availability throughout the country.

Furthermore, the second standard required the anesthesiologist to use the Spanish version of the World Health Organization's Surgical Safety Checklist. (5) However, it began to be implemented since 2010 in the PHM hospitals of the capital. (9) All the Anesthesiology services in these hospitals received the document to be completed by the surgical team members after their respective training. The nursing staff members submitted the information in the document based on questions asked to the principal surgeon and anesthesiologist, according to the stages of surgical care therein described. Following the enforcement of the second standard, completion of the checklist became mandatory at the national level for all healthcare facilities (public and private) performing surgery.

Consequences of the implementation of the Peruvian standards

Ten years after the implementation of the last standard, the significant consequences

on Peruvian surgical patients and workforce density are clearly evident. In particular, monitoring of the national indicators of surgical care has enabled the assessment of their impact as shown in Table 2 [developed based on references (6,9–18)]. Thus, the workforce increased from only 3 anesthesiologists per 100,000 inhabitants in 2005 to 7 specialists in 2020. Likewise, the volume of surgeries experienced a growing trend, reaching 3,511 surgeries per 100,000 inhabitants in 2019 prior to the beginning of the SARS-CoV-2 pandemic. These figures represent a significant progress towards achieving the recommended goal of 5,000 surgeries by 2030 (19). Regarding perioperative mortality, in the decade prior to the adoption of the first standard, a total of 11.4 anesthesia-associated cardiac arrests were reported, as compared to 2.97 reported after the implementation of the standards.

These initiatives improved Peruvian patients' safety as evidenced by a reduction in postoperative mortality and heightened the professional status, hence attracting more physicians to Anesthesiology to improve workforce density. These national indicators experienced a significant improvement after the standards entered into force. In the light of the foregoing, it can be concluded that the implementation of the standards for the provision of safer anesthesia has been a cornerstone contribution to the advancement of Peruvian anesthesia and surgical care.

Table 2. Monitoring of anesthetic and surgical care indicators performance in Peru before and after the implementation of the anesthesia technical standards.

Indicators	Monitoring of indicators		
	Before implementation	After implementation	
Surgical workforce density	3 anesthesiologists per 100,000 inhabitants in 2005	36.6 surgical specialists per 100,000 inhabitants in 2016 (5.4 anesthesiologists per 100,000 inhabitants in 2016)	46.5 surgical specialists per 100,000 inhabitants in 2020 (7 anesthesiologists per 100,000 inhabitants in 2020)
Surgical volume	NA	1,969 surgeries per every 100,000 inhabitants in 2015	3,511 surgeries per every 100,000 inhabitants in 2019
Perioperative mortality	11.4 intraoperative cardiac arrests attributable to anesthesia per 10,000 cases in the period from 1995 to 1997 (Mortality 4.14 patients per 10,000 cases) *	2.97 intraoperative cardiac arrests attributable to anesthesia per 10,000 cases in the period from 2011 to 2015 (Mortality 0.54 patients per 10,000 cases). Total (all causes) intraoperative mortality: 5.26 per 10,000 surgeries in the same period. *, †	
Protection against impoverishing and catastrophic expenditure	37% of Peruvian population in 2004	69% of Peruvian population in 2014	95.16% of Peruvian population in 2020

*Data about perioperative mortality reported in two third-level hospitals, not national data. Study conducted prior to the implementation of the standards (the study population was 9,568 patients). NA: Data not available. † The study population was 74,096 surgeries.
Source: Developed by the authors using (6, 9-18).

ETHICAL DISCLOSURES

Ethics committee approval

This article is not a clinical study, but rather a historical perspective of the specialty, so it would not require approval by an ethics committee.

Protection of human and animal subjects

The authors declare that no experiments were performed on humans or animals for this study. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data

The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent

The authors declare that no patient data are disclosed in this article.

The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

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CSZ: wrote the manuscript, searched the databases (Medical College of Peru and Superintendencia Nacional de Salud-SUSALUD) for the required data, and approved the final manuscript.

MNJ: searched the databases (Medical College of Peru and Superintendencia Nacional de Salud-SUSALUD) for the required data and approved the final manuscript.

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Conflicts of interest

None declared.

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COMPLEMENTARY MATERIAL

Complementary material 1. Regulations concerning the specialty of Anesthesiology in the South American countries.

Country	Denomination, year of publication, and entity	Purpose	Source
Argentina	"Normas de organización y funcionamiento de equipamiento básico para quirófanos y salas de parto en anestesiología" (1992). Ministerio de Salud y Acción Social.	To establish the basic equipment in anesthesiology in operating rooms and delivery rooms.	Federación Argentina de Asociaciones de Anestesia, Analgesia y Reanimación. Normas de Equipamientos. [cited 2021 Aug 11] Available from: https://www.anestesia.org.ar/a/normas_de_equipamientos/43
	"Guía Básica para la Vigilancia Transoperatoria y Procedimientos diagnósticos en Anestesiología" (2000). Ministerio de Salud.	To ensure the access of the inhabitants to health services and ensure healthcare quality.	Federación Argentina de Asociaciones de Anestesia, Analgesia y Reanimación. Normas de Vigilancia Transoperatoria. [cited 2021 Aug 11] Available at URL: https://www.anestesia.org.ar/a/normas_de_vigilancia_transoperatoria/36
	"Directrices de Organización y Funcionamiento para Centro Quirúrgico en Establecimientos con Internación" (2020). Ministerio de Salud.	To ensure universal healthcare access, manage improvements in health risks in the country's facilities and improve the quality of health services.	Boletín Oficial de la República Argentina. Legislación y Avisos Oficiales. [cited 2021 Aug 11] Available from: https://www.boletinoficial.gob.ar/detalleAviso/primera/228242/20200424
Bolivia	"Normas de Diagnóstico y Tratamiento en Anestesiología" (2012). Standards created by Instituto Nacional de Seguros de Salud INASES and approved by Ministerio de Salud y Deportes.	To standardize the criteria in the care of insured patients.	Biblioteca Virtual de Salud Pública. Documentos. [cited 2021 Aug 11] Available from: http://saludpublica.bvsp.org.bo/cc/bo40.1/documentos/631.pdf
Brasil	"RESOLUÇÃO 2.174, DE 14 DE DEZEMBRO DE 2017 ANEXO I CONSENTIMENTO LIVRE E ESCLARECIDO" (2017). Entidades de Fiscalização do Exercício das Profissões Liberais / Conselho Federal de Medicina.	To update and modernize the practice of anesthesia	Sociedade Brasileira de Anestesiologia. [cited 2021 Aug 11] Available from: https://www.sbahq.org/wp-content/uploads/2018/03/RESOLUC%CC%A7A%CC%83O-2_174-de-14-de-dezembro-de-2017-Dia%CC%81rio-Oficial-da-Unia%CC%830-Imprensa-Nacional.pdf
Chile	"Normas técnicas operativas de certificación de las especialidades y subespecialidades médicas y odontológicas: requisitos generales y específicos" (2013). Ministerio de Salud.	To define the specific requirements of each medical specialty.	Ministerio de Salud. [cited 2021 Aug 11] Available from: https://www.minsal.cl/wp-content/uploads/2016/02/decreto31_2013.pdf
Colombia	"Ley 6 de 1991" (1991). Congress of Colombia.	Regulation of the medical specialty of Anesthesiology.	NormasSalud. [Cited 2021 Aug 11] Available from: https://www.normassalud.com/archivos/d398b29d3dbbb9bf201d4c7e1c19ff-9d43c15fd45a0cec46fbe9885ec3f6e97f
	"Decreto 97 de 1996" (1996). Presidency of the Republic of Colombia.	To ensure efficient and effective provision of healthcare services by Healthcare Provider Institutions members of the Social Security System.	Ministerio de Educación Nacional. [cited 2021 Aug 11] Available from: https://www.mineducacion.gov.co/1759/articles-103096_archivo_pdf.pdf
	"Normas mínimas 2009 para el ejercicio de la Anestesiología en Colombia" (2009). Sociedad Colombiana de Anestesiología.	To improve the safety of the professional practice of anesthesiology in Colombia.	Ibarra P, Robledo B, Galindo M, Niño C, Rincón D. Normas mínimas 2009 para el ejercicio de la anestesiología en Colombia. Colombian Journal of Anesthesiology. 2009; 37(3): 235-253.
	"Normas Mínimas de Seguridad en Anestesiología" (2015). Sociedad Colombiana de Anestesiología.	To serve as a reference guide for the practice of anesthesiology in the country.	Sociedad Colombiana de Anestesiología. Normas Mínimas de Seguridad en Anestesiología. Revisión y actualización. [cited 2021 Aug 11] Available from: https://scare.org.co/wp-content/uploads/Normas-minimas-vd.pdf
Ecuador	"Ley de Ejercicio Profesional de los Médicos Anestesiólogos" (2002). National Congress.	To regulate the activity of anesthesiologists and protect patient health.	DerechoEcuador. Registro Oficial. 3 de octubre de 2002. [cited 2021 Aug 11] Available from: https://www.derechoecuador.com/registro-oficial/2002/10/registro-oficial-3-de-octubre-del-2002
Paraguay	"Criterios de Calidad para la especialidad médica de Anestesiología y Reanimación" (2020). Agencia Nacional de Evaluación y Acreditación de la Educación Superior.	To serve as a reference in the definition of quality criteria for the medical specialty of Anesthesiology and Resuscitation.	Agencia Nacional de Evaluación y Acreditación de la Educación Superior. Compendio Normativo de la ANEAES. [cited 2021 Aug 11] Available from: http://www.aneaes.gov.py/v2/application/files/1515/8150/3740/Criterio_de_Calidad_Anestesiologia_y_Reanimacion.pdf
Uruguay	Decreto N ° 244/966: "Modificación del reglamento para el ejercicio de la Anestesiología" (1966). Ministerio de Salud Pública.	Adequately regulate this fundamental activity in the exercise of modern surgery.	IMPO. Centro de Información Oficial. Normativa y Avisos Legales del Uruguay. [cited 2021 Aug 11] Available from: https://www.impo.com.uy/bases/decretos/244-1966/2
	"Consenso Nacional sobre el ejercicio profesional de la Anestesiología, Declaración de Maldonado" (2004). Sociedad de Anestesiología del Uruguay.	To define the practice of anesthesiology as the specialty that deals with perioperative medicine, establish the areas of performance of the anesthesiologist, regulate the equipment for anesthesia work and promote the national validation of the regulations for compliance in public and private institutions.	Barreto J, Pepe R, Santos O, Corbo S, Alvariza A, Vignoli B et al. Consenso nacional sobre el ejercicio profesional de la anestesiología Declaración de Maldonado, 2004. Anest Analg Reanim. 2005; 20(1): 38-40.
Venezuela	"Normas de Seguridad para el ejercicio profesional de la Anestesiología en Instituciones Públicas y Privadas República Bolivariana de Venezuela" (2014). Sociedad Venezolana de Anestesiología.	Mandatory compliance in the country for the public and private practice of all anesthesiologists.	Sociedad Venezolana de Anestesiología. Normas de Seguridad. [cited 2021 Aug 11] Available from: https://svanestesia.org.ve/wp-content/uploads/NORMASSEGURIDAD.pdf

Source: Developed by the authors based on the referred sources.

Complementary material 2. Principal topics addressed by the first Peruvian anesthesia technical standard.

Topic	Recommendations
Anesthesiology service times	The Anesthesiology services had to deliver 24-hour service, 365 days per year. The scheduled work shift of all the service personnel, including nursing personnel, should not exceed more than 12 hours per day.
Number of operating rooms per hospital	For every 25 to 30 medical-surgical beds, or for every 50 hospital beds, there should be 1 OR.
Biomedical equipment for the OR, PACU and pain treatment unit	According to the complexity of the healthcare institution. However, there is mandatory equipment for all operating rooms, regardless of the complexity of the institution. Basic mandatory equipment: - Suction system - Intravenous infusion pumps - Cardiac arrest trolley - Difficult airway trolley - Defibrillator - Laryngoscope equipped with pediatric and adult blades - Anesthesia machine (including its characteristics). - Neonatal, pediatric, and adult ventilator - Transport monitor - Multi-parameter monitor (with measurement of capnography, pulse oximetry, central temperature, and electrocardiography).
Equipment check	Anesthesia machine, multi-parameter monitor, aspiration systems, and defibrillator prior to the onset of the anesthetic.
Process of anesthesia care for the patient	The standard described this process including the necessary requirements to start surgery, preoperative laboratory and diagnostic studies, monitoring during surgery (oxygenation, ventilation, circulation, temperature, and hypnotic state), postoperative care, and PACU discharge criteria.
Aspects of the service infrastructure	The standard established the location of the service within the hospital infrastructure, defined segmentation (rigid, semi-rigid, and open area) for the correct use of surgical garments, segmentation of OR infrastructure, and aspects of hospital engineering (water, electricity, drainage, lighting, air conditioning system, oxygen systems, compressed air, suction systems, and fire networks).
Surgical indicators	The standard detailed indicators such as number of surgical procedures performed, number of patients assessed at the anesthesia office (preoperative assessment), number of scheduled surgeries, percentage of emergency surgical procedures, and OR performance. The most important indicators were the OR mortality rate, anesthesia-associated mortality, percentage of postponed surgeries, and rate of patients who developed post-surgical hypoxic encephalopathy.

OR: Operating room. PACU: Post-anesthesia care unit.
Source: Adapted by authors from (2).

Complementary material 3. Principal topics addressed by the second Peruvian anesthesia technical standard.

Topic	Recommendations	
Anesthesia care process	The anesthesia care process was divided into three periods: preanesthesia, intraoperative, and postanesthesia. A nationwide anesthesia informed consent record, preanesthesia assessment record, intraoperative anesthesia assessment record, and PACU record were designed.	
	Preanesthesia period	The required preoperative assessment of the patient included a review of the medical record, clinical examination, assessment of anesthesia and cardiovascular risks, assessment of patient comorbidities, fasting, and request for the appropriate laboratory studies according to the level of hospital complexity. It further reinforced the assessment measures to be performed by the anesthesiologist in the OR, including checking the correct functioning of all the biomedical equipment, especially the anesthesia machine with an adequate oxygen supply, and the availability of an emergency oxygen cylinder. Finally, the standard also required the anesthesiologist to use the Spanish version of the World Health Organization's Surgical Safety Checklist.
	Intraoperative period	The anesthesiologist should initiate the anesthetic procedure only when the head surgeon is present in the OR and must remain in the room throughout the entire procedure. During surgery, anesthesia practitioners should be monitoring oxygenation, ventilation, circulation, and body temperature. Also, depending on the patient's condition or type of surgery, they should monitor central venous pressure, invasive blood pressure, pulmonary artery pressure, cardiac output, anesthetic gases, neuromuscular relaxation, and state of consciousness. All of the above must be written in the corresponding intraoperative anesthetic record.
	Período Post-anestesia	The standard defined the conditions to transfer the patient to the PACU, proper care measures and assessment in this unit, and the discharge criteria to the hospitalization ward or transfer to the step-down or intensive care unit.
Professional risks of the personnel working in the Anesthesiology Services	This standard classified the professional risks of the personnel into five groups: risks caused by chronic inhalation of residual volatile anesthetics, risks caused by the infections transmitted from patients to the medical personnel, risks caused by physical, chemical, and biological agents used in OR, risks caused by the nature of the work of the anesthesiologist (mainly due to fatigue and labor stress), and risks caused by ionizing radiation. Moreover, Peruvian health institutions must adopt measures for the mitigation of these risks.	

OR: Operating room. PACU: Post-anesthesia care unit.
Source: Adapted by authors from (5).