Ethical distribution of resources, palliative care, and other bioethical aspects in times of pandemic in Mexico

Distribución ética de recursos, cuidados paliativos y otros aspectos bioéticos de relevancia en tiempos de pandemia en México

Julio Tudela Cuenca,* María Elizabeth de los Ríos Uriarte,**
Jhosué Alfredo Hernández González***

https://doi.org/10.36105/mye.2022v33n2.05

Abstract

Medical care during the COVID-19 pandemic presented major ethical and bioethical challenges. Among the most complex were the distribution of healthcare resources and the consequent selection of patients to meet their chances of survival, and the incorporation of palliative care, informed consent and advance directives into the protocols for action and admission of patients. From utilitarian criteria, which fought only for social value and utility, to personalistic criteria based on the principles of subsidiarity and solidarity, patient care became urgent regardless of their condition. This article addresses the dilemma about the criteria of distribution that deepened over this time, and proposes that health protection, being a universal human right, cannot go unnoticed in patients with

^{*} University of Valencia, Institute of Life Sciences of the Catholic, Valencia, Spain. Email: julio.tudela@ucv.es https://orcid.org/0000-0001-7189-4900

^{**} Universidad Anáhuac México, Faculty of Bioethics. Huixquilucan, State of Mexico. Mexico. Email: elizabeth.delosrios@anahuac.mx https://orcid.org/0000-0001-9600-445X

^{***} Hospital Español. Mexico City. Mexico. Correo electrónico: jhosue.hernandez g25@ anahuac.mx https://orcid.org/0000-0002-4537-5135 Reception: October 15, 2021. Acceptance: December 07, 2021.

unfavorable prognoses, proposing the incorporation of palliative care in medical care.

Keywords: Health resources, Bioethics, COVID-19.

1. Introduction

On December 31, 2019, the first cases of a pneumonia of unknown etiology were declared in the city of Wuhan, Hubei province, China (1). A few days later, the Chinese authorities declared that the causative agent of this previously unknown infection was a new type of coronavirus called SARS-CoV-2 virus, better known as COVID-19. With the succession of cases in the following months, it became clear that infection by this new virus caused multiple clinical manifestations, ranging from those compatible with the common cold to pneumonia, coagulation disorders, septic shock and multi-organ failure (2).

With the increase in the number of global cases, on March 11, 2020, the Director General of the World Health Organization (WHO), Tedros Adhanom Ghebreyesus, declared COVID-19 a pandemic (3).

The fragility of the different health systems soon became evident, especially in developing countries such as Mexico, since, being a pathological entity still unknown in the medical field at the beginning, its treatment is reduced to symptomatic control, which is often insufficient in severe cases and evolves into irreversible deterioration, requiring the use of palliative care (4).

Dilemmas about the distribution of limited resources in the face of the constant increase in the number of confirmed cases quickly arose, thus disrupting the way emergency care protocols were implemented and the way both curative and palliative medical care was provided.

Ethical criteria were essential, as well as the search for care alternatives that would allow a fair distribution of healthcare resources, and provide patients with the benefit of treatment that was appropriate for them and did not entail worse burdens and suffering.

As severe cases of COVID became more complicated, the need for referral mechanisms to intensive care units increased, creating an urgent need for trained physicians and a proper system of palliative medical care. Patients whose prognosis was guarded required ordinary measures of symptom control and psychological support; abandoning them or omitting care was not an option.

The International Association for Hospice and Palliative Care defines palliative care (PC) as the active holistic care of individuals of all ages with SHAS (severe health suffering that results when critical physical, social, spiritual and emotional aspects are compromised) (5).

Faced with these scenarios of scarce resources and urgency in the implementation of palliative care in the pandemic, several difficulties were identified. First, the need to strengthen and integrate palliative care in health systems was identified, including the use of telemedicine, which has proven to be an effective tool in medical care in times of confinement required by the pandemic, with the purpose of reducing the suffering and pain of the disease. Secondly, the pressing need to control symptoms, especially dyspnea, which is one of the most characteristic in this coronavirus disease. According to the International Narcotics Control Board (INCB) instructions to governments, countries should maintain continuous access to opioid analysics and controlled medicines during the pandemic by implementing simple measures in the export, transport and delivery of opioid medicines. Third, the urgency of alleviating suffering through adequate communication and containment of psychosocial and spiritual suffering, as well as accompaniment in the mourning process, was highlighted (6).

The presence of severe cases of COVID in patients close to death makes palliative care an essential health service and a central component of universal coverage. It should therefore be demanded that inequalities in access and use of the services involved be reduced, since health protection is a universal human right (7).

However, health resources have been allocated, almost in their majority, according to the criterion of survival chances, leaving aside and discarding those patients who, although they have no chance of a favorable evolution, are still alive and deserve attention and control of their symptoms in order to achieve an adequate quality of life. This raises highly relevant ethical questions that should be analyzed.

2. Selection criteria and ethical considerations

The tremendous dilemma of deciding who can be the recipient of these means or of essential medical care must be resolved by strictly following solid and well-founded criteria that promote the correct application of bioethical principles, without falling into unjust discrimination.

Circumstances of armed conflict, environmental catastrophes or pandemics pose this dramatic imbalance between available resources and the need for care. In such circumstances, it is necessary to decide to whom resources are allocated and to whom they are not, even at the risk of compromising their cure or survival.

In a situation such as the current coronavirus pandemic, and with the need to use many resources related to intensive care, including invasive assisted ventilation, the demand for patients who may need this life support may far exceed the number of ventilators available, in addition to the consumables needed to operate them and the qualified technical personnel who must apply and supervise them (2).

The dilemma arises when faced with the dilemma of which patients are to be intubated and which are not, with the consequences that may result from these decisions. Similarly, the dilemma

may arise when faced with the need for surgery or any other lifethreatening emergency.

This is the «catastrophic» application of the principle of justice, which makes it necessary to «desist from treatment» in patients who could otherwise recover if resources were sufficient. The criterion of applying them to patients with the best chance of survival and with the least foreseeable sequelae is, in principle, the right one, the least bad, knowing that a decision is taken in which the double effect is given, by which patients who could have survived after taking the selective decision will die, but which constitutes the only existing possibility, with no alternatives.

If this selective criterion is applied correctly, in reality we would not be letting patients die as if it were a form of euthanasia, but rather trying to save those most likely to survive with the minimum of serious sequelae, given the limited resources. The death of these patients is not sought, or even tolerated, but is simply inevitable.

The universal protocol of assigning criteria and evaluations of patients' condition has usually been used to make decisions on who to allocate resources to. This protocol is known as *triage*.

It should be remembered that *triage* dates back to the Napoleonic wars, when on the battlefield it was necessary to select which soldiers were to be transferred to hospitals and which were not, and the criteria governing this selection were based on the patients' chances of survival, although the ethical imperative of saving as many people as possible was not always achieved.

In the context of the coronavirus pandemic, the correct application of the principles of justice and subsidiarity that accompany this practice requires that, before making decisions such as those described above, all possible alternatives should be explored, including the possibility of referring patients to other hospitals or treatment areas; the reallocation of resources destined for other needs so that they can be applied to patients at vital risk; the planning of human and material resources in order to anticipate demand and

be able to deal with anomalous situations such as the one in question; the optimization of available resources, such as the sharing of the same respirator by two patients, and others that ethically illuminate the decision making process with respect to patients who are candidates for intensive care (8).

However, the approach to the practice of traditional clinical medicine, where there is generally no scarcity of resources, is far from that in which medical care suffers from such scarcity. Assets, for the most part, are not divisible and priority of care cannot be said to be a function of who got there first or who can pay the most. This is why the system governing the distribution of resources during a health emergency is subsumed under the practice of public health, since the latter is the one with the necessary tools to reorganize the entire health field and cope with the emergency. The criteria for care, therefore, change, with each patient's chances of survival coming first, without this implying the omission or abandonment of others.

It is important to emphasize this difference, since the application of *triage* for the selection of candidates for admission to the ICU and the application of invasive mechanical ventilation should be restricted, as has been specified, to extreme situations in which the referral of patients to other centers or the provision of new resources proves insufficient to adequately meet the demand in the hospital or intensive care unit. Therefore, it should always be the last option, not applicable when care can be provided by other means (3).

When it has been determined that the setting and urgency of the response warrant a screening process, an initial criterion for triage would be the potential for significant benefit and reversibility of the severity of the process in care recipients where, for example, invasive mechanical ventilation would be indicated. A careful evaluation of the survival possibilities of these patients and the magnitude of the sequelae that they could suffer in the future as a consequence of the evolution of their disease is necessary, so that those with the best prognosis for recovery and survival with the minimum of sequelae would be selected.

The application of other criteria in a discriminatory manner, such as the patient's age or other circumstances such as mental disorders, dementia or any other form of disability or dependence, would not be bioethically acceptable, since it would imply proceeding against the respect for the dignity that every human being possesses regardless of his or her circumstances, and would move away from the basic criterion of selection based on the possibilities of survival without serious sequelae.

However, even in these circumstances where the benefit is not clearly identified, the principle of respect for the patient's dignity implies providing a type of care that can help the patient to cope with his or her symptoms, and provide quality of life for the time remaining until death.

However, at the beginning of the pandemic, the criteria for care were incorporated into the *triage* protocols, which did not sufficiently consider supportive treatment or symptom relief, i.e., palliative care, but only the criteria for treatment and cure of the disease, thus leaving out those patients who had the disease but had little chance of survival.

Therefore, these protocols had to adapt to the bioethical requirements in the national and international field, and incorporate in their evaluations, in addition to objective scales (9) of measurement that consider physiological parameters and not merely subjective judgments with utilitarian criteria (10), the fourth type of medical care according to the General Health Law of our country, which is palliative care. This ensures the ethical duty of not abandoning the patient, since the fact that he/she does not receive critical medicine resources focused on curing and reversing his/her condition does not mean that he/she is denied hospital treatment (11).

These patients should be assured of quality palliative care that provides emotional and spiritual support, impeccable symptom control, adequate palliative sedation if indicated, and psychological support both them and their families before the imminent mourning (12).

This is how palliative care was a central reflection of medical care in this pandemic, either because of the saturation of places and beds in hospitals that could not receive more patients, or because of the natural course of the disease that, little by little, it was discovered that it attacked more people with underlying risk conditions such as diabetes, hypertension or other respiratory or cardiac ailments. The need not to omit due assistance and obligatory medical care forced the implementation of referrals to palliative treatment units, or to refer patients to a palliative physician to help them manage their symptoms.

Not least, this care also played an important role in the need for communication of bad news or for adequate emotional support in the family's mourning (13), and a supportive religious orientation and sympathetic to the patients' religious beliefs. Even in those who do not profess any religion, spiritual care and accompaniment are imperative in these contexts of despair and suffering (14).

3. Other bioethical issues in the care of COVID patients

In patients requiring end-of-life care for COVID-19, this process has been compromised by the influence of the rapid progression of the disease (15). Given the short time from the onset of symptoms to death, this makes timely management even more difficult, often resulting in patients accessing palliative care too late or not at all.

Few patients have sufficient time and the most conducive environment to adequately process information, as they are subjected to extremely high levels of stress, with little time to discern and be able to make a decision knowing all the options and assuming their consequences.

It is worth mentioning here the difficulty experienced not only in Mexico, but also in other parts of the world where bioethical issues such as informed consent and advance directives were not contemplated as part of the protocol for the evaluation and selection of patients.

Informed consent is extremely important even in the context of health emergencies, since it contains information on the patient's diagnosis, prognosis and treatment, which allows the patient, in the exchange with the health professional, to strengthen his autonomy in making decisions about his health and care, and to give an ethical character to the offer of palliative care (16).

Along with the above, a fundamental issue was the advance directives document (17), which revealed the lack of cultural knowledge about it, on one hand, and the emotional resistance to put one's own will in writing, knowing that, perhaps one day, it will no longer be expressed verbally (18).

Furthermore, a situation that deserves urgent attention in Mexico is the fact that it is not yet a matter of federal jurisdiction; that is, there are states that have incorporated it since 2008 and states that have not yet done so, which leaves people at a disadvantage who cannot subscribe to it, even if they could or would like to do so.

The importance of this document lies in the fact that, by explicitly rejecting extraordinary means aimed at futilely sustaining life and opting for ordinary measures that alleviate symptoms and provide comfort, but without artificially or disproportionately prolonging life, it rules out those treatments that, potentially, it is considered would not provide sufficient benefit for the patient nor would they provide a better quality of life.

In the context of the pandemic, where dyspnea and low oxygen saturation in infected patients led to medical decisions such as intubation knowing that, on occasions, they would not recover, added to the difficulty of having very few ventilators and experts to manage them, made the decision on whether or not to intubate a patient ethically extremely complex. If these documents had

been available before or upon presentation to the respiratory *triage* area, and assuming that the patients were conscious and oriented to sign their advance directives, the ethical burden of the decisions would have been greatly lightened because, according to their physiological evaluations, it would have been determined that the patient should be directed to ordinary and/or palliative care, since intubation could have represented an extraordinary measure resulting in no benefit for the patient.

A related consideration is the application of the so-called «adequacy of therapeutic effort»; in particular, to be able to withdraw a ventilator once it is considered that it is not being beneficial for the patient and, on the contrary, is causing greater burdens. In this case, death does not occur because of the withdrawal of the ventilator, but because of the previous and prolonged deterioration process; that is, it should not be seen as a side effect or tolerated as a greater good, since it is only medically assessed as a consequence of the disease process itself, but does not result from a therapeutic action or a clinical decision, much less a bioethical one (19).

Another critical point of debate was the possibility of health professionals opting for conscientious objection, either because of the risk involved in coming into contact with patients and not having adequate personal protective equipment, or because they lacked the knowledge to deal with a situation in which the needs and demands far exceeded their capacity to satisfy them.

Conscientious objection, on the other hand, cannot be exercised in a health emergency scenario, and no physician should argue this on the basis of his oath and his profession, which is essentially one of helping and caring for the sick. Therefore, conscientious objection cannot be based on reasons that do not justify a collision of the legal duty with the moral convictions of the person making the objection, and this is not the case. A situation of risk or lack of preparation does not justify a moral conflict, and cannot be invoked as an impediment to conscience. Therefore, no medical pro-

fessional is exempt from intervening with his or her knowledge and skills. To do so would be to fall into omission of assistance, which is also severely punished. Furthermore, the scarcity of resources does not justify, for any reason, the abandonment of patients (20).

If it should happen, as it did in Mexico, that many professionals did not have the proper protective equipment, the lack of care could be justified, but only temporarily, and should be resumed as soon as the necessary equipment is obtained. However, the authorities and the State, for their part, must be responsible for providing the necessary supplies to the health workers so that they can fully perform their duties.

All these considerations mean that today it is more urgent than ever to talk about bioethics and, above all, palliative care, and to initiate platforms to promote them at all levels of government. In addition, training professionals in palliative medicine is emerging as one of the most urgent lines of action for the country's medical schools.

With regard to the latter, it goes without saying that the training of a palliative specialist should be interdisciplinary and comprehensive, since the healthcare professional who accompanies patients at the end of life should have the skills to handle situations of emotional stress, advance care planning, changing and sometimes refractory symptoms that require palliative sedation, and knowledge of the concepts and resources available (21). Likewise, he/she must be able to conveniently assess the psychological and spiritual care needs of the patient and his/her environment, being able to refer to the appropriate specialists.

It cannot be overlooked that palliative care specialists have played and will continue to play an essential role in the management of mourning by the patient's family and relatives, which can be difficult in extreme situations such as the present one. The necessary means and procedures should be put in place so that, even in difficult situations due to the need for isolation and risk of transmis-

sion, family members can have access to patients in the final moments of their lives if possible, implementing the necessary precautions, and say goodbye to them after their death, a circumstance that would contribute to overcoming grief.

5. Conclusions

The COVID-19 pandemic has led to a global rethinking of the way in which not only medical care has been considered, but also the logistics of distribution of health resources and the criteria on which it was based.

If improvisation and utility were the bases on which transcendental decisions such as the lives of people rested at the beginning of the pandemic, it is now known that these criteria must be replaced by others that consider universal values such as human dignity before social utility.

The imperative to respect life and promote the health of people necessarily crosses the integrity and ethics of medical care, even in times of pandemic. This is why it is necessary to incorporate elements that allow the implementation of bioethical principles that guide the actions of health professionals, both in the recovery of the health of the sick and in the search for the common good as a society.

Informed consent, which safeguards the autonomy and responsibility of patients in making decisions about their health; advance directives that opt for ordinary measures without prolonging life by causing more pain and suffering and allowing death to occur at the appropriate time following the natural course of the disease; that is, orthothanasia, as well as the urgent incorporation of palliative care in the care of emergency health situations, are fundamental aspects that require providing catastrophes such as this pandemic with a human and ethical face that considers the incalculable value of human life as a criterion of the utmost respect.

It is true that, in the face of scarce resources, the need to make choices becomes imperative, but if these choices are kept only as exceptions and not as generalized rules, as last choices and not as first, in their right dimension that seeks to seek the greater good given the social impact of the situation, then the distribution of health resources in emergency situations will comply with the bioethical criteria of respect for human life, solidarity and subsidiarity, as well as freedom and responsibility, through adequate information and respect for the will of the patient, contributing to the exercise of the best medicine and respect for the dignity that every human being deserves.

Bibliographic notes

- ¹ The Universal Declaration of Human Rights contemplates, in its article 25, first paragraph, the following: «Everyone has the right to a standard of living adequate for the health and well-being of himself and his family, and in particular food, clothing, housing, medical assistance and necessary social services; he also has the right to insurance in case of unemployment, sickness, invalidity, widowhood, old age or other cases of loss of his means of subsistence due to circumstances beyond his control». From the foregoing, it follows that health is a good and a right that must be guaranteed by the states.
- ² Although there were no specific scales for the assessment of patients with COVID-19, some others commonly used in the hospital setting were adopted to assess patients in intensive care units, such as sofa or apache I, II or III.
- ³ The case of Mexico was controversial, since on April 14, 2020, the General Health Council, the highest body of authority in health emergencies in the country, published the Bioethics Guide for the Allocation of Limited Resources of Critical Medicine in Emergency Situation in Mexico, where patients were encouraged to be selected based on the criteria of «lives lived» and «lives to be completed»; that is, the lives lived were those of those over 60-65 years of age who no longer deserved to be cared for or assigned resources to consider, since they had lived long enough; On the other hand, those who did have to allocate resources and attention were those who still had a «life to complete»; that is, to young patients. This criterion left aside, for utilitarian reasons, older adults and, therefore, received harsh criticism that made the Council rectify and opt to incorporate the criterion of objectively evaluated chances of survival, instead of the criterion of age only in the selection process, and this is how, having withdrawn these guides two days after

they were issued, a new version was made public two weeks later, which is the one in force to this day.

⁴ It must be remembered here that advance directives have been contemplated in some states of the Mexican Republic since 2008 when the law of advance directives came into force in Mexico City and is currently regulated in 14 states of the Republic.

Bibliographic references

- 1. Ge H, Wang X, Yuan X, Xiao G, Wang C, Deng T, et al. The epidemiology and clinical information about COVID-19. *European Journal of Clinical Microbiology & Infectious Diseases*. 2020; 39(6): 1011-1019.
- https://doi.org/10.1007/s10096-020-03874-z
- 2. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases from the Chinese Center for Disease Control and Prevention. *JAMA*. 2020; 323(13): 1239. https://doi.org/10.1001/jama.2020.2648
- 3. Organización Mundial de la Salud. Declaración de pandemia por COVID-19. (Accessed December 03, 2021). Available at: https://www.who.int/es/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—11-march-2020
- 4. Ramos A. Cuidados paliativos y COVID-19: Rol, dificultades y dilemas bioéticos en época de pandemia. La humanidad puesta a prueba. Bioética y COVID-19. Madrid: Universidad Pontificia Comillas. 2020.
- 5. Radbruch L, De Lima L, Knaul F, Wenk R, Ali Z, Bhatnaghar S, et al. Redefining palliative care. A new consensus-based definition. *J Pain Symptom Manage*. 2020; 60(4): 754-764. https://doi.org/10.1016/j.jpainsymman.2020.04.027
- 6. Radbruch L, Knaul F, De Lima L, de Joncheere C, Bhadelia A. The key role of palliative care in response to the COVID-19 tsunami of suffering. *The Lancet.* 2020; 395(10235): 1467-1469. https://doi.org/10.1016/S0140-6736(20)30964-8
- 7. Naciones Unidas. Declaración Universal de Derechos Humanos. (Accessed December 01, 2021). Available at: https://www.un.org/es/about-us/universal-declaration-of-human-rights
- 8. Universidad Anáhuac México. ADD-KNOWLEDGE to your decisión making: Practical Guideline for ethical decision making in scenarios with scarce resources during the COVID-19 pandemic. *Neuroética y Bioética Clínica de la Facultad de Bioética*. (Accessed December 01, 2021). Available at:
- https://www.anahuac.mx/mexico/EscuelasyFacultades/bioetica/covid-19
- 9. Consejo General de Salubridad. Guía Bioética para Asignación de Recursos Limitados de Medicina Crítica en Situación de Emergencia. (Accessed November 14, 2021). Available at: http://www.csg.gob.mx/descargas/pdf/index/informacion_relevante/GuiaBioeticaTriaje_30_Abril_2020_7pm.pdf

- 10. Consejo General de Salubridad. Guía Bioética para Asignación de Recursos Limitados de Medicina Crítica en Situación de Emergencia. (Accessed November 14, 2021). Available at: http://www.csg.gob.mx/descargas/pdf/index/informacion_relevante/GuiaBioeticaTriaje_30_Abril_2020_7pm.pdf
- 11. SEMICYUC. Recomendaciones éticas para la toma de decisiones en la situación excepcional de crisis por pandemia COVID-19 en las unidades de cuidados intensivos. (Accessed November 13, 2021). Available at: https://semicyuc.org/wp-content/uploads/2020/03/%C3%89tica_SEMICYUC-COVID-19.pdf
- 12. Romano M. Between intensive care and palliative care at the time of COVID-19. *Recenti Prog Med.* 2020; 111(4): 223-230.
- 13. Powell VD, Silveira MJ. What should palliative care's response be to the CO-VID-19 Pandemic? *J Pain and Symptom Management*, 2020; 60(1): e1-e3. https://doi.org/10.1016/j.jpainsymman.2020.03.013
- 14. Torres-Espinosa C, López-Ramírez J, Pérez-Moreno D. Cuidados paliativos para pacientes con infección por SARS-CoV-2/COVID-19; propuesta de un modelo de atención. *R Mexicana de Anestesiología*. 2020; 43(4): 288-295. https://doi.org/10.35366/94942
- 15. Lovell N, Maddocks M. Etkind SN, Taylor K, Carey I, Vora V, *et al.* Characteristics, symptom management and outcomes of 101 patients with COVID-19 referred for hospital palliative care. *J Pain Symptom Manage*. 2020; 60(1): e77-e81. https://doi.org/10.1016/j.jpainsymman.2020.04.015
- 16. Ortiz M. *El Consentimiento Informado en el ámbito sanitario: Responsabilidad Civil y Derechos Constitucionales*. Madrid: Dykinson: 2021.
- 17. Gobierno Federal de México. Ley de Voluntad Anticipada. (Accessed December 01, 2021). Available at: https://www.gob.mx/inapam/articulos/ley-de-voluntad-anticipada-el-derecho-a-una-muerte-digna
- 18. Forero JJ, Vargas I, Bernales M. Voluntades Anticipadas: Desafíos éticos en el cuidado del paciente. *Persona y Bioetica*. 2019; 23(2): 224-244. https://doi.org/10.5294/pebi.2019.23.2.5
- 19. Universidad Anáhuac México. Guía de criterios éticos ante emergencias sanitarias en México en el contexto de la emergencia sanitaria por COVID-19. Facultad de Bioética. (Accessed December 06, 2021). Available at:
- https://www.anahuac.mx/mexico/EscuelasyFacultades/bioetica/
- 20. Universidad Anáhuac México. «Objeción de conciencia del personal sanitario» en Guía de criterios éticos ante emergencias sanitarias en México, en el contexto de la emergencia sanitaria por COVID-19. Facultad de Bioética. (Accessed December 06, 2021). Available at: https://www.anahuac.mx/mexico/EscuelasyFacultades/bioetica/
- 21. Organización Panamericana de la Salud. Cuidados paliativos: Guías para el manejo Clínico. (Accessed December 06, 2021). Available at: https://paho.org/hq/dmdocuments/2012/PAHO-Guias-Manejo-Clinico-2002-Spa.pdf

This work is under international license Creative Commons Reconocimiento-No-Comercial-Compartirlgual 4.0.

