QUALITY INDICATORS IN CRITICALLY ILL PATIENTS

First edition: May 2005
ISBN: 609-5974-0
Depósito legal: M-24032-2005

Board of Directors

Lluís Cabré Pericas
Juan Roca Guiseris
Pedro Galdos Anuncibay
José Luís Escalante Cobo
Lluís Blanch Torra
Jose María Domínguez Roldán
Juan B. López Messa
Gumersindo González Díaz
Fernando Castillo Suero
Pedro Navarrete Navarro
Francisco J. Munárriz Hinojosa

Methodology Coordinator

Rosa María Saura Grifol (ADF)

Scientific Coordinator

María Cruz Martín Delgado

Authors:

María Cruz Martín Delgado
Lluís Cabré Pericas
Javier Ruiz Moreno
Lluís Blanch Torra
Jesús Blanco Varela
Fernando Castillo Suero
Pedro Galdos Anuncibay
Juan Roca Guiseris

Collaborators:

- SEMICYUC work groups

Luis Álvarez Rochas
María de los Desemparados Bernat Adell
José Manuel Borrallo Pérez
José María Campos Romero
José María Domínguez Roldan
Enrique Fernández Mondéjar
Abelardo García de Lorenzo y Mateos
Vicente Gómez Tello
Santiago Ramón Leal Noval
Juan González Maestre
Pilar Marco Garde
Javier Maynar Moliner

Pedro Navarrete Navarro
Mercedes Palomar Martínez
Pilar Saura Agel

- ***Other collaborators***

Genís Carrasco Gómez
Antonio Jesús Pérez de la Cruz
Pedro Ignacio Jiménez González

Acknowledgments

- For their contribution to the elaboration of specific indicators:

Josep Costa Terradas
Cristina Fransi Labat
Silvia Figuerola Gómez
Carmen Martín Arias
Ricard Molina Latorre
Ana Ochagavía Calvo

- For revising the manuscript:

Ricardo Abizanda Campos
Antonio Artigas Raventós
Manuel Avellanas Chavala
Miguel Ángel de la Cal López
María Dolores Escudero Augusto
Juan García Pardo
Juan Bautista López Messa
Fernando Ortiz Melón
Manuel Sánchez Palacios

TABLE OF CONTENTS

1. PREFACE

The strategic plan of the Spanish Society of Intensive and Critical Care and Coronary Units (SEMICYUC) provides for the development of instruments to aid in the continual improvement of the quality of care.

The Board of Directors designated the elaboration of the Quality Indicators for the Treatment of Critically Ill Patients to the Society's Work Group for Planning, Organization, and Management and to the Avedis Donabedian Foundation (ADF). I am pleased to present the result of two year's labor in this endeavor.

It should come as no surprise that these quality indicators are for the treatment of the critical patient, as the logo of our Society indicates we are after all "the Professionals for the Critical Patient". For this reason, we consider it our duty to provide physicians specializing in critical care medicine and nursing staff with the means to measure the quality of care in their daily practice, not only in hospital intensive care units, but wherever critical care patients are found. Our mission to ensure optimal care for these patients is intrinsic to our training as specialists, and society at large holds us accountable for this task.

These indicators are not intended to be tools to control our daily practice, rather they provide a system of self-assessment that will enable us to quantify and analyze what we do and how we do it in order to help us determine those aspects that can be improved. Obviously, this first version is not definitive; like protocols, quality indicators need to be revised and updated periodically in function of new developments in healthcare and the growing body of scientific evidence.

A large number of intensivists that belong to the SEMICYUC and nurses belonging to the Spanish Society for Intensive Care and Coronary Unit Nursing (SEEIUC) have participated in this project, perhaps a greater number than in any other of the Society's undertakings, and I believe that this attests to the cohesion and good health of our professional societies.

I would like to thank the ADF and especially Dr. Rosa Maria Saura for instructing us in the methodology used for the elaboration of the indicators and for their patience in responding to our doubts and questions. Without their help and dedication, this project could never have been realized with the rigor that characterizes each and every one of the indicators.

I would also like to express my gratitude to the Society's Work Group for Planning, Organization, and Management, who undertook this project with great enthusiasm from the time it was first suggested by the Board of Directors. Dr. Mari Cruz Martín, the scientific director throughout the project, is undoubtedly the person who has done the most work and who has done the most to make the rest of us work, too. For this reason, I would like to take this opportunity to recognize Dr. Martín as the true architect of these Quality Indicators for the Treatment of Critically Ill Patients.
In recent years, the SEMICYUC's work groups have acquired an essential role not only in the Society's annual congress but also in many other affairs. The participation of all of the work groups, each and every one of which has developed the specific indicators for their area (corrected and adapted methodologically by the directors and authors of the indicators), has been extremely helpful. I would like to acknowledge the efforts and

of these work groups, with a special mention for all of those designated by their groups to be in charge of the project, and thank them for a job well done.

I would also like to thank the individual members of the SEMICYUC and of the SEEIUC for their contributions and willingness to help the scientific direction and authors of the project in the elaboration of the indicators.

Various members of the SEMICYUC took part in the final correction of the indicators and I would also like to thank them for their efforts and collaboration.

Last but not least, on behalf of the SEMICYUC, I would like to thank Boehringer Laboratories for their financial support, which has made this project possible.

Dr. Lluís Cabré
President of the SEMICYUC

2. INTRODUCTION

2.1 CONCEPTS AND EVOLUTION OF QUALITY IMPROVEMENT

The improvement of the quality of healthcare has been a major concern for healthcare professionals for many years, if not from the inception of the medical professional itself. We have long strived for excellence, albeit not always through specific and recognized methodologies.

The development of instruments that enable **quality to be measured** has been essential in the transformation of this concern into a way of working. Once it became possible to measure (evaluate), the focus shifted from quality control to quality assurance. Later, from the 1990s, we have progressed toward total quality systems.

Nevertheless, this evolution has not always followed a precise chronological order; rather different phases have overlapped and coincided. As in many other areas, when we discuss quality of care we must bear in mind that classification is useful in that it helps us to situate ourselves at a theoretical level and to understand the order of events, although they do not always precisely describe a fact or real situation.

As the concept of health itself has evolved, the focus has shifted from the most basic approaches grounded in the individual relationship between the physician and the patient to more general approaches that include not only the totality of services provided by healthcare professionals but that have also incorporated care of the entire community and by extension the concepts of efficiency and equity in the distribution of healthcare resources and the ethics of decision making.

The first documented events in the history of the assessment of the quality of care date to the second half of the 19th century, when **Florence Nightingale** studied the mortality rates of military hospitals during the Crimean war.

Another forerunner in this field was **Ernest Codman**, cofounder of the American College of Surgeons, who developed a method that allowed the outcomes of surgical intervention to be measured and classified in 1912 in the United States.

Another well-known reference is the definition of the "**Minimum Standard**" by the American College of Surgeons in 1918, which specified the minimum standards that hospitals needed to fulfill and laid the foundation for the system of accreditation in the United States.

Another noteworthy event was the creation of the **Joint Commission on the Accreditation of Hospitals (JCAH)** in 1951. Comprised of a consortium of American professional colleges, the JCAH first undertook to accredit those hospitals that voluntarily applied for accreditation and met pre-established standards of quality. Throughout its evolution, the JCAH has promoted the development of different methodologies in the area of quality and have extended their scope to include other types of healthcare centers; for this reason, the organization changed its name and is currently called the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

One important development in methodology in the 1950s was the formulation of the **medical audit**, a new method for evaluating quality, by Paul Lembcke of Johns Hopkins University School of Medicine. Lembcke, deeply concerned about the variability in outcomes observed in his daily practice, established what would lead to **explicit criteria** to enable comparison among centers and professionals and a systematic approach to data collection that included verification and study design.

Later, the establishment of MEDICARE and MEDICAID, federal programs to provide healthcare to the elderly and economically disadvantaged, in 1965 and 1966 and the stipulation that only hospitals with JCAHO accreditation would be recognized by these programs, represented another step forward.

The work done by J. Williamson in the 1970s also deserves mention. Williamson introduced a new methodology based on the concept of "achievable benefit not achieved" (ABNA), which measures the difference between the standards of diagnosis and treatment considered desirable and that actually achieved, measured both through review of clinical histories as well as reviewing patients' conditions and through questionnaires in which patients themselves report their condition. Williamson carried out part of his work in primary care (hypertension, etc.), establishing the "desirable results" of care and placing special emphasis on the improvement of the quality obtained after it was evaluated. This marked the beginning of the stage of **quality assurance**, after the earlier stage that was more focused on evaluation than on improvement.

However, R. Brook is without a doubt one of the authors that has had the greatest impact on the change in perspective toward quality assurance. Brook established long-term follow-up of patients and showed the low correlation between the healthcare process and outcomes. Brook's studies led to the development of methods to establish the appropriateness of procedures, one of the most interesting contributions, as they brought about the hypothesis that enabled variability to be explained (payment systems, training of professionals, etc.) and the way to approach this variability from the viewpoint of studies on quality.

This brief historical review would not be complete without mentioning **Professor Avedis Donabedian**, who has undertaken numerous studies and helped to rethink the concepts of quality in healthcare -- from the classification of methods of quality assessment in structure, process and outcome in 1966 to reflection about the impact of the industrial model of quality on the healthcare model in 1992. His contributions, both theoretical and practical, have been invaluable for those professionals working to improve the quality of care.

Like Donabedian, Heather Palmer has been instrumental in defining the **dimensions of quality** that have had a decisive influence on the conceptualization of this discipline.

2.2 PRACTICAL EXPERIENCES

The practical application of theoretical formulations on quality in healthcare has taken place in many countries around the world. Apart from the United States, noteworthy experiences have taken place in Canada, Australia, the Netherlands, the United Kingdom, Portugal, Italy, France, Mexico, Argentina…and also here in Spain.

The Spanish experience begins in 1982 with the implementation of the first Quality Program in the Hospital de la Santa Creu i Sant Pau in Barcelona, although some important initiatives had preceded this on less systematic, smaller scale.

From this first experience, the subject of quality was progressively introduced in other hospitals, as well as at other levels of healthcare, such as primary care, social-healthcare, and mental health.

In Spain, two noteworthy projects are the creation of the Spanish Society for Quality in 1984 and, at the level of primary care, the development of the ***Programa Ibérico*** together with Portugal that enabled the implementation of improvement programs in over 300 centers by combining strategies for training, incentives, and follow-up.

Also noteworthy is the contribution of the **Avedis Donabedian Foundation**, whose basic mission since its creation in 1990 has been to collaborate with professionals and healthcare centers, public administrations, professional associations, and other public and private institutions in the healthcare sector with the aim of improving the quality of care.

The consolidation of the methodology of **bioethics** also represents an important advance that will influence the field of quality by redefining the criteria for good practice in many circumstances.

On the other hand, the **public administrations**, both of the Spanish central government with the "General Healthcare Law" of 1986 and the governments of Spain's Autonomous Communities with various laws and ordinances in their regions, have also promoted and favored the implementation of quality assessment and improvement programs throughout the different levels of healthcare.

2.3 EXPERIENCE WITH INDICATORS

During the 1980s, the JCAHO required all centers applying for accreditation to have integrated quality plans for the entire center. This requirement initially met with strong opposition, leading to the establishment of a standard that implemented the **Indicator Measurement System (IMSystem)** for monitoring quality of care and its methodological development.

These systems for monitoring quality are conceived as an overall evaluation of an entire department and not only of the areas in which problems might be detected. In order to apply them, the type of care performed by a particular department or center must be defined by a process of dimensioning, the main work areas need to be established, and indicators that enable them to be measured must be created. These indicators are assessed periodically and provide an overview of the quality of care in a department as

well as enable action to be taken when necessary. They were applied basically to the evaluation of different specialties and less intensely at the level of entire centers.

The JCAHO started to develop a system of outcomes indicators integrated into the accreditation system, and these allowed different service providers to be compared. To this end, an ambitious project was undertaken to develop indicators and this continued through the mid-1990s.

The JCAHO's strategy along these lines had limited success due to the appearance of other systems of indicators on a nationwide level in the United States. The JCAHO currently employs their own system of indicators called ORYX, which is revised and updated periodically, with a total of 52 indicators in 2004. Other countries, especially Australia, have, through their own scientific societies, also advanced greatly in the development of outcomes indicators that allow different centers to be compared.

In 1990, the University Hospital Consortium, comprising over 50 university hospitals located throughout the United States, developed a compendium of clinical indicators that encompassed most medical specialties, elaborated by a committee of experts and used by all members of the Consortium.
In 1991, "Monitoring with Indicators" was published by J.G. Caroll, and this influential work has since been updated several times.

In 1995 the Australian Council of Healthcare Standards introduced clinical indicators for intensive care units elaborated by the Australian and New Zealand Intensive Care Society into its assessment program.

Other experiences closer to home that have resulted from initiatives by scientific societies in Spain are:

a) 1993: Catalan Society of Family and Community Medicine with the publication of "Criteria for Quality in Primary Healthcare", which contains a list of quality indicators for different work areas of primary care.
b) 1999: The Spanish Society of Gynecologists and Obstetricians with Quality of Care Indicators for Gynecology and Obstetrics, covering all areas of these specialties.
c) 2001: Catalan Society of Emergency Medicine with the project "Emergency Departments: Indicators for Measuring the Quality of Care", financed by the Agency for the Evaluation of Medical Technology and Research and embraced by the Spanish Society of Emergency Medicine.
d) 2003: Spanish Society for Pediatric Emergencies, with the adaptation of C to the pediatric area.
e) 2003: Spanish Society for Palliative Care Medicine, with Quality Indicators for Palliative Care.

3. METHODOLOGY FOR THE EVALUATION AND IMPROVEMENT OF QUALITY: “MONITORING SYSTEMS”

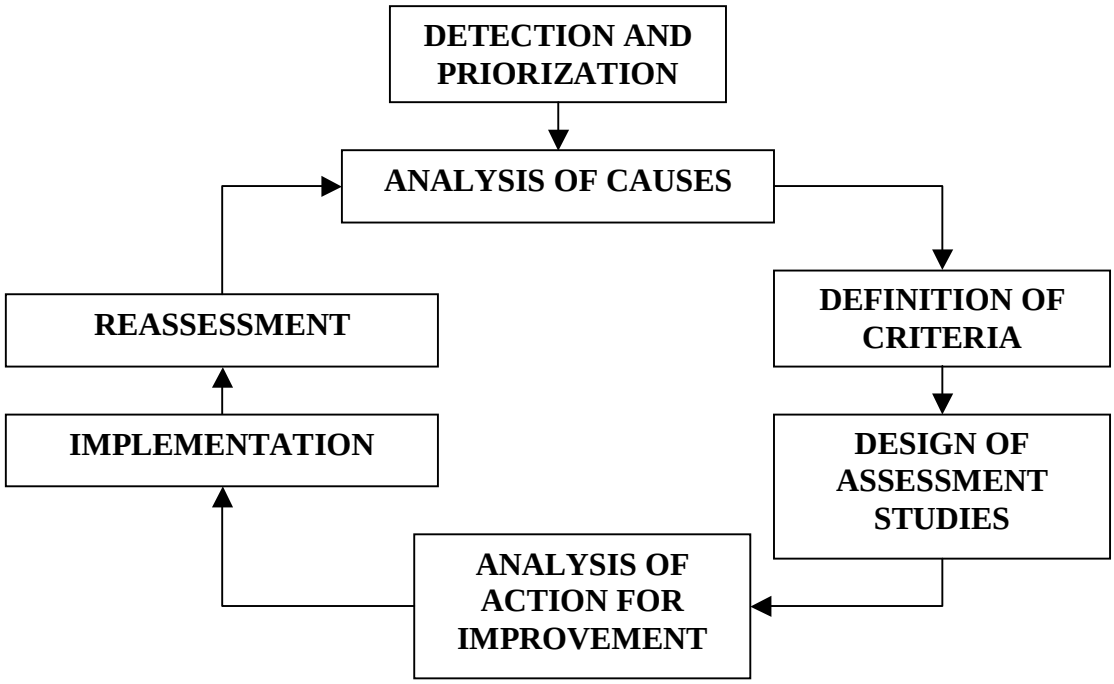
There are two basic approaches to the evaluation and improvement of the quality of care.

a) The so-called **"room for improvement"** model that begins with the identification of problems, followed by their analysis and proposals for improvement, conceptually based on W. Edwards Deming's cycle of evaluation and improvement, better known as PDCA (Plan, Do , Check, Act), adapted by Header Palmer (Figure 1).
b) **"Monitoring systems"**, used to detect problems and periodically evaluate performance, the fundamental element of which is the "INDICATOR".

When we work with the "room for improvement" model we try to answer the question: What could we or should we improve? On the other hand, the underlying question of the "monitoring systems" approach is: of everything that we do, what is most important and how can we assure that we are doing it well enough?

In any case, these approaches are complementary and it is common to work with both of them in parallel. Monitoring systems can be viewed as a way to seek opportunities for improvement: whenever the results of monitoring do not meet the expected standard, we detect an opportunity for improvement and enter the PDCA cycle.

Figure 1.



MONITORING SYSTEMS

A monitoring system periodically measures and evaluates relevant aspects of care by means of quality indicators, which are the basic unit of a monitoring system.

Indicators are, therefore, instruments of measurement that indicate the presence of a phenomenon or event and its intensity.

A monitoring system requires that the type of care performed first be defined by the process of dimensioning, which consists of establishing the principal care areas and then elaborating the indicators that will enable the outcome of the healthcare process to be measured.

Monitoring allows us to make sure that "the basics are alright". This system is based on repeated quantitative measurements. Variations seen in successive results for an indicator cannot be interpreted directly: these variations might be random, in which case we refer to them as endogenous or systemic causes, or they might be caused by aspects related to people, professionals, organization, environment, etc., in which case we refer to them as exogenous or extrasystemic causes. The latter are what show us those aspects on which we need to work to improve the quality of care delivered.

In any case, the final objective in **monitoring** is to identify problems, situations that can potentially be improved, or deviations from the standard, and **indicators** serve to **call our attention** to this problem or **sound an alarm** to warn us of this possibility.

We could say that an indicator is a criterion for quality, albeit a very specific one, and therefore all of the conditions and characteristics recommended for the construction of criteria (acceptable, comprehensible, relevant, measurable, etc.) apply to indicators. Likewise, we speak of indicators as applying to structure, process, and outcome in function of the area of evaluation.

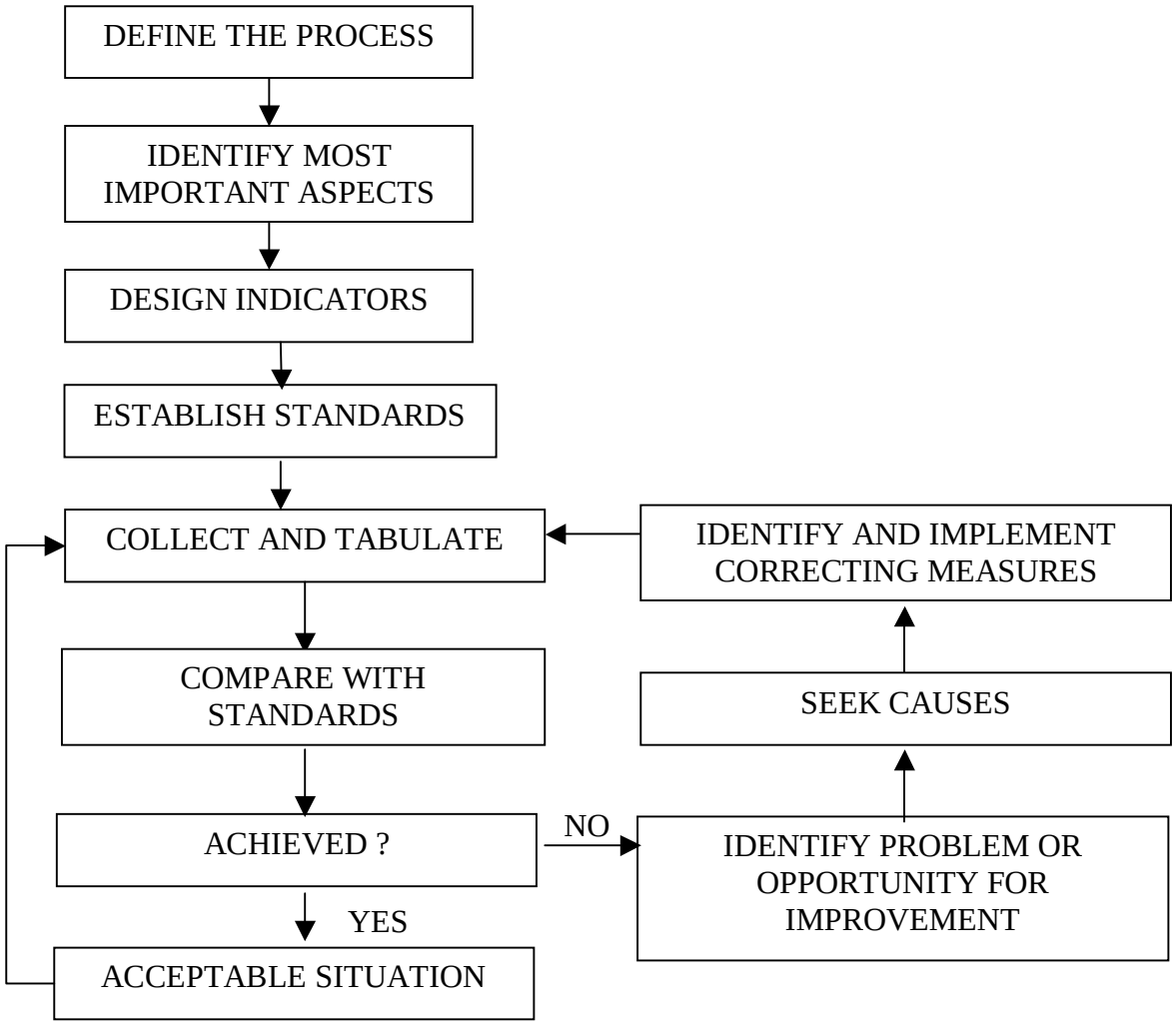
Given that an indicator is an instrument of measurement that is used systematically and that its result will be used in managing quality, it is essential to ensure that it reflects reality and is useful.
To this end, all indicators must comprise the following three characteristics or properties:

1. **Validity:** An indicator is valid when it fulfills the aim of identifying situations in which quality of care can be improved. We also speak of face validity as the extent to which an indicator is intelligible. Can its meaning and importance be understood without long, drawn-out explanations?
2. **Sensitivity:** When it detects ALL cases in which a real situation or problem with quality of care occurs.
3. **Specificity:** When it ONLY detects those cases in which there are problems related to quality of care.

These aspects must be taken into consideration when constructing indicators. Only those with the highest level of validity, sensitivity, and specificity should be chosen.

The steps involved in designing a monitoring system are shown in figure 2.

Figure 2



Source: Modified from “Quality Criteria in Primary Healthcare, 1993”

DEFINE THE PROCESS. This consists of specifying the area of care to be monitored. Activities, professionals, structures, circuits, etc. involved in the process should be specified. This will guarantee that no important aspect that can be improved will be ignored. When dealing with a department it corresponds to the dimensioning phase that aims to provide a complete map of the department itself. If the starting point is the improvement cycle, the process is already defined in the improvement cycle itself.

IDENTIFY THE MOST IMPORTANT ASPECTS. This is a matter of prioritizing the most important aspects related to the previously defined process or processes. Different criteria can be used for prioritization, e.g.:

- Number of users or patients affected
- Risk for the patient involved in the process
- Activity identified as problematic

DESIGN THE INDICATORS AND ESTABLISH STANDARDS. The quality indicator is a quantitative measure used as a guide to control and evaluate the quality of the most important aspects of care. Its design should include a description of the different aspects that ensure its validity and reliability. Table 1 provides a brief description of these aspects, and a more complete definition is found in Section 4.3.

Table 1.

SECTION	DEFINITION
Dimension	Important aspect of care assessed by the indicator
Justification	Usefulness of the indicator as a measurement of quality, related to its validity, i.e. does what we aim to measure make sense?
Formula	Mathematical expression
Explanation of terms	Definition of the terms in the formula that might be ambiguous
Population	Identification of the unit of study
Type	Structure, process, or outcome
Source of data	Origin and sequence of data obtainment
Standard	Desired level of fulfillment of the indicator
Commentaries	Includes reflections concerning validity and bibliographic references

BEGIN SYSTEMATIC MEASUREMENT with collection and tabulation of results. The periodicity of measurement, which can vary in function of the type of event, its incidence, or the degree of interest for the organization and the accessibility of the information, should be decided on prior to beginning. Measurement normally takes place monthly or annually, and this will provide an estimation of the degree of fulfillment of the indicator.

COMPARE WITH PREVIOUSLY ESTABLISHED STANDARDS. Results should be compared with the reference standard as well as with prior measurements for this indicator. In the first case, substandard situations (i.e. when performance is below the minimum required) will be identified, and in the second case we can evaluate the evolution of the behavior of the indicator over time.

INTERPRETATION OF RESULTS. When the result of a comparison reveals a substandard situation or a worsening of results, this should be considered a call for attention or an alarm. As stated above, we must consider whether the cause is random (systemic or endogenous cause) or whether we face a problem or situation that can be improved (extrasystemic or exogenous cause), in which case it will be necessary to take action.

Sometimes the action to be taken is clear and obvious, but at other times it will be necessary to begin the steps of the cycle of evaluation again if the causes of the problem are unknown. This is the point where the monitoring system is complemented by the evaluation cycle to obtain the results expected for a quality evaluation and improvement program.

Once the causes have been identified and the actions proposed for improving quality have been implemented, systematic measurement of the indicator continues and we observe whether the desired improvements have been accomplished. In this case, we say that we have the indicator “under control” again.

4. QUALITY INDICATORS IN THE CRITICALLY ILL PATIENT

4.1 METHODOLOGY OF ELABORATION

Creation of the work group. The quality indicators presented here have been elaborated by a large group of professionals belonging to the SEMICYUC; all of the Society's work groups have been represented, and the Avedis Donabedian Foundation has overseen and coordinated this project. The SEMICYUC invited these professionals to participate in the project because of their accredited knowledge and experience in specific areas of critical care. Initially, a single representative from each of the Society's work groups was recruited, but eventually many other members contributed their expertise on specific issues or were involved as consultants. Once the work group was formed and the objectives of the project defined, a training workshop was held to reach a consensus on the system of working and to ensure unity of concepts.

This project was put together in 12 successive meetings that took place over a 19-month period in which the participant's prior work performed individually was integrated and a consensus reached.

Method of working. The project was carried out according to the above-described (Section 3) methodology. Each of the Society's work groups chose those aspects that they considered to be of fundamental importance.

Each group elaborated different indicators that dealt with the distinct aspects of the process and dimension of quality. After consultation among groups in the different work sessions, a consensus was reached regarding which indicators best fulfilled the conditions of validity, sensitivity, and specificity.

When the first draft was finished, it was submitted for review to a group of 16 critical care professionals who had not taken part in the previous process of design and who were therefore not influenced by the evaluations and opinions of the members of the work group. The different proposals were considered and discussed by the work group, who then decided whether or not to incorporate them into the definitive text. This final version was approved in April 2005 and includes a total of 120 indicators.

Of the 120 definitive indicators, the work group reached a consensus as to the twenty most important or fundamental for the specialty. The SEMICYUC considers these indicators to be essential and recommends their application in all critical care departments. These fundamental indicators are indicated in **bold type** in Section 4.4 and are shaded in the tables in Sections 5 and 6.

It is evident that this version cannot be considered definitive; like protocols, indicators must be revised and updated periodically as clinical practice and scientific evidence evolve and shed new light on relevant issues.

4.2 PRACTICAL APPLICATION OF THE PROPOSED MONITORING SYSTEM

Indicators are instruments for the improvement of quality and as such monitoring them should never be considered an end in and of itself. In other words, the measuring stage is necessary and sometimes essential to determine the level of the quality of care, but it is merely a means to an end: It enables us to take action to improve the weak points in the system and to select the most effective course of action, but measuring is never the final objective.

Having a set of indicators like the one presented here streamlines complicated processes involved in continual improvement, such as determining which aspects of care are fundamental and designing the instruments to measure them, and, above all, providing a point of reference (standard) with which to compare our practice.

The indicators are presented here in the same order as the Society's work groups, making it easy for them to be identified and for each department or professional to choose the ones that seem most appropriate for their professional practice.

This is a large set of indicators, and it does not seem realistic or practical for any department to monitor all of them. Nevertheless, the authors considered it useful to elaborate and present a sufficient number of indicators to cover the most important aspects of all of the activities carried out within the specialty, leaving the choice of which ones to monitor systematically to each critical care department. We recommend monitoring a limited number of indicators at first and bearing in mind that a monitoring system is a commitment to both measurement and periodic evaluation of the results obtained.

As a general guideline, the following criteria might be useful in helping each department choose which indicators to employ:

- Variability in the healthcare practice within the department
- Known weak points
- Basic aspects of care
- Possibility of risks
- Existence of valid and reliable sources of information
- Possibility to generate results automatically.

It is not advisable to incorporate too many indicators at first, as this would make it difficult to follow them. Moreover, it is important to remember that it may at times be necessary to quantify the data manually, depending on the information technology implemented, and that this will require time and professional resources that may be unavailable in the early stages.

Another advantage of the progressive incorporation of indicators as the informatics system improves is that the team gains valuable experience in their use.

This approach also allows more and more professionals to become involved with the quality improvement program.

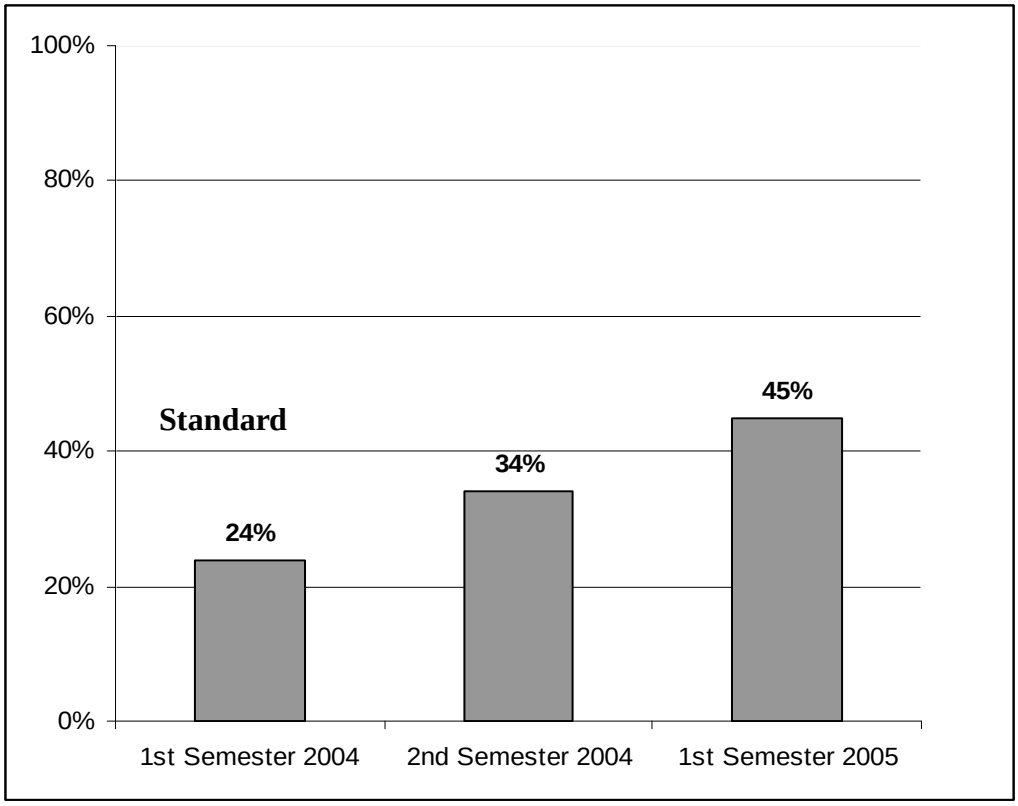
One possible option is to begin monitoring those indicators considered "fundamental" by the work groups. In a manner of speaking, these indicators represent not only those points that should be done properly, but also those for which it is essential to know the quality of care.

From the organizational point of view, it is convenient to assign the responsibility for monitoring the indicator or indicators for a particular process to a specific professional, usually a staff physician. The overall responsibility obviously falls always on the chief of the department, and he or she will distribute the responsibilities for monitoring the different indicators chosen among the staff.

This is usually done when the department elaborates its planning calendar, and the monitoring of indicators is incorporated as another objective for quality.

The person responsible for each indicator will verify the reliability of the source of data and will follow up the results at the established periodicity and report them to the rest of the department.

It is helpful to present the results in the form of a graph that allows the evolution of the indicator over time and its relation to the standard of reference to be easily observed.
The following example shows the presentation of the results of the evolution of an indicator whose standard is 40%.



When the evolution of the indicator is negative or the results are substandard, the person responsible for the indicator should propose the most appropriate course of action: this might entail direct measures to improve quality or it might be necessary to carry out a study to determine the causes of the poor results.

Actions should be well defined and planned, and a calendar for the individuals in charge of performing the proposed tasks should be elaborated.

ACTIONS PROPOSED	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec

Monitoring the results of the indicator before and after the actions taken for improvement will show to what extent these measures have been effective.

It bears reminding that the adoption of a monitoring system using indicators implies the commitment of the entire department to act when the practice evaluated shows substandard results; the causes must be investigated and action taken to improve the quality of care. Otherwise, measurement becomes a meaningless routine that is useless for the clinical management of the department.

4.3 USE OF THE PROPOSED INDICATORS

This section aims to provide a more detailed definition of the components of the indicators and how to use them to measure healthcare practice.

Dimension: Characteristic or attribute of healthcare quality examined by means of this indicator.

Justification: Usefulness of the indicator as a measurement of quality. This is related to validity, i.e. does what we are measuring make sense? Will it help to identify areas that need to be improved?

Formula: Mathematical expression that reflects the results of the measurement; although often expressed as a percentage, it can also be expressed as a mean or an absolute number.

Explanation of terms: Definition of those aspects of the indicator expressed in the formula that might be ambiguous or open to various interpretations, e.g. If an indicator mentions administering prophylaxis for gastrointestinal hemorrhaging (indicator no. 59), the drugs to be used to achieve it are specified.

Population: Description of the unit of study that will be the object of measurement. It can refer to patients, examinations, visits, diagnoses, etc. Occasionally, it will be necessary to introduce exclusion criteria for the population thus defined. For instance, if we want to know how many patients with acute coronary syndrome and elevated ST segments (STEMI) have undergone early reperfusion (indicator no. 6), it will obviously be necessary to exclude patients with STEMI with indications to withhold life support.

On the other hand, when quantifying the indicator, it is not always necessary or practical to carry out the measurement over the entire population defined during the entire period of the study (annual, biannual, etc.); in these cases a **sample** is reviewed.

This may be the case for indicators that describe the level of compliance with informed consent policies, early treatment of cardiovascular dysfunction, assessment of nutritional condition, etc. In these cases it is not necessary to verify informed consent for each and every transfusion or technique performed; rather this can be done on a sample. In order to choose a sample, it is necessary to take into account the number of units necessary (size) and to ensure that the selection is random for the result to be considered representative of the entire population. If the sample is collected appropriately, the value of the indicator will apply to the entire population. For some indicators, specific recommendations are provided for quantification using a sample, whether by selecting cases randomly or selecting sampling days. In the latter case, all of the cases produced on the sampling day will be included and care should be taken to include all days of the week.

Type: This refers to the classification of the indicator according to the focus of the evaluation, with three possibilities:

- Structure: used for indicators that measure aspects related to technological, organizational, or human resources necessary for care, as well as to the existence of protocols
- Process: used for indicators that evaluate the way in which care is delivered with the resources available, protocols, and scientific evidence
- Outcome: used for indicators that measure the consequences of the healthcare process, expressed in terms of complications, mortality, opportunities missed, failed circuits, quality of life, etc.

Source of data: Defines the origin of data and the sequence of data obtainment necessary to enable quantification of the indicator. This is an important aspect, as the level of information management and processing will be different at each center and this might determine whether or not it is possible to measure the indicator.
In this project, the concrete specifications for this section have been omitted, normally with a reference to the patient's clinical records, as information management and processing will be different at each center.

Standard: This reflects the desired level to be met for an indicator. It is not always easy to establish a standard, given the variability in the scientific evidence and reference sources consulted.

In this project, the team of authors has made an effort to synthesize variable information from diverse sources and has reached a consensus regarding the standard for each indicator with the idea that, rather than reflect the results of common practice, the standard should represent the level of good practice that should be demanded in light of the scientific evidence while being, at the same time, achievable with the available resources.

In some cases the standard has been set at 100% or 0% when it is a matter of ensuring that the fundamentals are realized.

Commentaries: This section is reserved for reflections on the validity of the indicator or pointing out possible factors that might cause confusion that should be taken into account when interpreting the results. It also incorporates the most important bibliographic references consulted for the elaboration of the indicator and setting the standard.

4.4 LIST OF INDICATORS

(Those considered fundamental are marked in **bold-faced type**.)

CARDIAC CARE AND CPR

1. **Early administration of acetylsalicylic acid in acute coronary syndrome**
2. Early administration of beta-blockers in acute myocardial infarction
3. Cardiac catheterization in high-risk non-ST-elevation myocardial infarction
4. Risk stratification in non-ST-elevation myocardial infarction
5. Door-needle time in ST-elevation myocardial infarction
6. **Early reperfusion techniques in ST-elevation myocardial infarction**
7. Hospital mortality in ST-elevation myocardial infarction
8. Early treatment of cardiovascular dysfunction
9. Therapeutic hypothermia after cardiac arrest
10. Use of the Utstein template
11. Perioperative myocardial infarction in heart surgery
12. Incidence of early complications in the implantation of permanent pacemakers

ACUTE RESPIRATORY INSUFFICIENCY

13. Incidence of barotrauma
14. Ventilator circuit change at 7 days
15. Serious complications during prone position in acute respiratory distress syndrome (ARDS)
16. Spontaneous breathing trial
17. Selective decontamination of digestive tract in patients at risk
18. Limited alveolar pressure (P plateau) in invasive mechanical ventilation
19. Limited maximum inspiratory pressure (P peak) in invasive mechanical ventilation
20. **Semirecumbent position in patients undergoing invasive mechanical ventilation**
21. Changing heat-and-moisture exchangers
22. **Prevention of thromboembolism**
23. Unplanned extubation
24. Reintubation
25. Early implementation of noninvasive mechanical ventilation on worsening of chronic obstructive pulmonary disease (COPD)
26. Low tidal volume during invasive mechanical ventilation in acute lung injury

NEURO-INTENSIVE CARE AND TRAUMATOLOGY

27. Examination of potentially severe trauma (PST) patients by intensivists
28. Tracheal intubation within 8 hrs in patients with severe traumatic brain injury and Glasgow coma score < 9
29. **Surgical intervention in traumatic brain injury with subdural and/or epidural hematoma**

30. Use of corticosteroids in traumatic brain injury

31. Incidence of acute respiratory distress syndrome (ARDS) in severe trauma

32. **Monitorization of intracranial pressure in severe traumatic brain injury with pathologic CT findings**

33. Mortality in severe traumatic brain injury

34. Early osteosynthesis in fractures of the femoral diaphysis

35. Early surgical fixation of open fractures

36. Early cerebral arteriography in subarachnoid hemorrhage

37. Administration of nimodipine in subarachnoid hemorrhage

38. Polyneuropathy in critical patients

39. Immediate CT examination in ischemic stroke

40. Intravenous fibrinolysis in acute ischemic stroke

41. Use of somatosensory evoked potentials in post-anoxic encephalopathy

INFECTIOUS DISEASES

42. Bacteremia related to central venous catheter

43. Urinary tract infection related to urethral catheter

44. **Pneumonia associated to mechanical ventilation**

45. **Early management of severe sepsis / septic shock**

46. Inappropriate empirical antibiotic treatment for infections treated in the ICU

47. Methicillin-resistant ***staphylococcus aureus*** infections

48. Indications for isolation

49. Administration of corticosteroids in septic shock

50. Early initiation of antibiotic therapy in severe sepsis

METABOLISM AND NUTRITION

51. Complications of total parenteral: hyperglycemia and liver dysfunction

52. Maintaining appropriate levels of glycemia

53. Severe hypoglycemia

54. Identification of nutritional risk

55. Assessment of nutritional status

56. **Early enteral nutrition**

57. Monitorization of enteral nutrition

58. Calorie and protein requirements

59. **Prophylaxis against gastrointestinal hemorrhage in patients undergoing invasive mechanical ventilation**

NEPHROLOGY

60. Indications for continuous dialysis

61. Dopamine use in acute renal failure

62. Incidence of acute renal failure in non-coronary critical patients

63. Incidence of acute renal failure in coronary patients

64. Prevention of contrast-induced nephropathy in coronariography

65. Assessment of acute renal failure in critical patients

SEDATION AND ANALGESIA

66. Monitorization of sedation

67. **Appropriate sedation**

68. Daily interruption of sedation

69. **Pain management in unsedated patients**

70. Pain management in ventilated patients

71. Inappropriate use of muscle relaxants

72. Monitorization of neuromuscular blockage

73. Identification of delirium

BLOOD COMPONENTS

74. Informed consent for transfusion of blood components

75. Inappropriate transfusion of fresh-frozen plasma

76. Inappropriate transfusion of platelet –rich plasma

77. **Inappropriate transfusion of packed red blood cells**

TOXICOLOGY

78. Appropriate digestive decontamination in intoxications by ingestion

79. Minimum antidote requirements

80. Early hemodialysis in acute intoxication

TRANSPLANTATION

81. **Organ donors**

82. Evaluation of liver transplantation in acute liver failure

83. Monitorization of potential organ donors

84. Diagnosis of brain death

NURSING

85. Removal of nasogastric tube occasioned by occlusion

86. Appropriate bronchial aspiration

87. Information from nursing staff to patients' families

88. Intrahospital transport

89. Cuff pressure

90. Monitoring alarms management

91. Accidental falls

92. Nursing registers in the ICU

93. Medication errors

94. **Compliance with hand-washing protocols**

95. Accidental removal of intravascular catheters

96. Revision of cardiac arrest carts

BIOETHICS

97. Appropriate end-of-life care

98. **Information to patients' families in the ICU**

99. Incorporation of advance health directives in the decision-making process

100. Informed written consent

101. **Withholding and withdrawing life support**

102. Use of restraints

PLANNING, ORGANIZATION, AND MANAGEMENT

103. The existence of a medical emergency team

104. Suspension of scheduled surgery

105. **Perceived quality survey at discharge from the ICU**

106. Inappropriate or precipitated discharge from the ICU

107. Codification of information at discharges from the ICU

108. Delayed discharge from the ICU

109. Delayed admission to the ICU

110. Standardized mortality rate

111. Autopsy rate

112. Staff orientation plan in the ICU

113. **Presence of an intensivist in the ICU 24 hrs/day**

114. **Adverse events register**

115. Unscheduled readmission to the ICU

INTERNET

116. Access to relevant medical sources in electronic format

CONTINUING EDUCATION, TRAINING, AND RESEARCH

117. Existence of basic protocols

118. Research activity

119. Scientific publications

120. Continuing medical education

FUNDAMENTAL INDICATORS	Number	Group or specialty
1. **Early administration of acetylsalicylic acid in acute coronary syndrome**	1	**Cardiac care and CPR**
2. **Early reperfusion techniques in ST-elevation myocardial infarction**	6	**Cardiac care and CPR**
3. **Semirecumbent position in patients undergoing invasive mechanical ventilation**	20	**Acute respiratory insufficiency**
4. **Prevention of thromboembolism**	22	**Acute respiratory insufficiency**
5. **Surgical intervention in traumatic brain injury with subdural and/or epidural hematoma**	29	**Neuro-intensive care and traumatology**
6. **Monitorization of intracranial pressure in severe traumatic brain injury with pathologic CT findings**	32	**Neuro-intensive care and traumatology**
7. **Pneumonia associated to mechanical ventilation**	44	**Infectious diseases**
8. **Early management of severe sepsis / septic shock**	45	**Infectious diseases**
9. **Early enteral nutrition**	56	**Metabolism and nutrition**
10. **Prophylaxis against gastrointestinal hemorrhage in patients undergoing invasive mechanical ventilation**	59	**Metabolism and nutrition**
11. **Appropriate sedation**	67	**Sedation and analgesia**
12. **Pain management in unsedated patients**	69	**Sedation and analgesia**
13. **Inappropriate transfusion of packed red blood cells**	77	**Blood components**
14. **Organ donors**	81	**Transplantation**
15. **Compliance with hand-washing protocols**	94	**Nursing**
16. **Information to patients' families in the ICU**	98	**Bioethics**
17. **Withholding and withdrawing life support**	101	**Bioethics**
18. **Perceived quality survey at discharge from the ICU**	105	**Planning, organization, and management**
19. **Presence of an intensivist in the ICU 24 hrs/day**	113	**Planning, organization, and management**
20. **Adverse events register**	114	**Planning, organization, and management**

5. EXPOSITION OF INDICATORS

Indicator number 1 (fundamental indicator)

Name of the indicator	EARLY ADMINISTRATION OF ACETYLSALICYLIC ACID (AAS) IN ACUTE CORONARY SYNDROME (ACS)
Dimension	Effectiveness and risk
Justification	Administering AAS reduces mortality and reinfarction at 35 days in patients with ACS, making its use mandatory except when contraindicated.
Formula	No. of patients with ACS administered AAS in the first 24 hrs ---------- x100 No. of patients with ACS
Explanation of the terminology	• 24 hrs: time interval from onset of pain to administration of AAS • Administration can take place in the hospital or prior to arriving at the hospital
Population	All patients with ACS discharged from critical care during the period reviewed • Exclusion criterion: patients with contradindication for AAS
Type	Process
Source of data	Clinical records Admissions department
Standard	100%
Commentaries	References: • Ellerbeck EF, Jencks SF, Radford MJ, Kresowik TF, Craig AS, Gold JA, Krumholz HM, Vogel RA.Quality of care for Medicare patients with acute myocardial infarction. A four-state pilot study from the Cooperative Cardiovascular Project. JAMA. 1995 May 17; 273(19):1509-14. • Marciniak TA, Ellerbeck EF, Radford MJ, Kresowik TF, Gold JA, Krumholz HM, Kiefe CI, Allman RM, Vogel RA, Jencks SF. Improving the quality of care for Medicare patients with acute myocardial infarction: results from the Cooperative Cardiovascular Project. JAMA. 1998 May 6;279(17):1351-7 • ACC/AHA guidelines for the management of patients with ST-elevation myocardial infarction--executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 1999 Guidelines for the Management of Patients With Acute Myocardial Infarction). Circulation. 2004 Aug 3; 110(5):588-636.

Indicator number 2

Name of the indicator	EARLY ADMINISTRATION OF BETA-BLOCKERS IN ACUTE MYOCARDIAL INFARCTION (AMI)
Dimension	Effectiveness and risk
Justification	Administering beta-blockers reduces morbidity and mortality in patients with AMI. Moreover, the cost of beta-blockers is negligible.
Formula	No. of patients with AMI administered beta-blockers in the first 24 hrs ---------- x100 No. of patients with AMI
Explanation of the terminology	• 24 hrs: time interval from onset of pain to administration of beta-blockers
Population	All patients with AMI discharged from critical care during the period reviewed • Exclusion criterion: patients with contraindication for beta-blockers
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Ellerbeck EF, Jencks SF, Radford MJ, Kresowik TF, Craig AS, Gold JA, Krumholz HM, Vogel RA.Quality of care for Medicare patients with acute myocardial infarction. A four-state pilot study from the Cooperative Cardiovascular Project. JAMA. 1995 May 17; 273(19):1509-14. • Marciniak TA, Ellerbeck EF, Radford MJ, Kresowik TF, Gold JA, Krumholz HM, Kiefe CI, Allman RM, Vogel RA, Jencks SF. Improving the quality of care for Medicare patients with acute myocardial infarction: results from the Cooperative Cardiovascular Project. JAMA. 1998 May 6;279(17):1351-7 • ACC/AHA guidelines for the management of patients with ST-elevation myocardial infarction--executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 1999 Guidelines for the Management of Patients With Acute Myocardial Infarction). Circulation. 2004 Aug 3; 110(5):588-636.

Indicator number 3

Name of the indicator	CARDIAC CATHETERIZATION IN HIGH-RISK NON-ST-ELEVATION MYOCARDIAL INFARCTION (NSTEMI)
Dimension	Effectiveness
Justification	Cardiac catheterization should be attempted as soon as possible in NSTEMI patients. Balloon angioplasty in association with new techniques and coadjuvant treatments (intracoronary prostheses & antithrombotics & antiplatelets) enables better stratification of risk and overall improvement of the treatment.
Formula	$\frac{\text{No. of patients with high-risk NSTEMI undergoing cardiac catheterization in the first 48 hrs}}{\text{No. of patients with high-risk NSTEMI}} \times 100$
Explanation of the terminology	• High-risk NSTEMI: presence of one or more of the following: recurrent ischemia, troponin levels elevated with respect to laboratory reference levels, signs of hemodynamic instability within the period of observation, development of major arrhythmias • First 48 hrs: time interval from diagnosis to cardiac catheterization
Population	All patients with NSTEMI discharged from critical care during the period reviewed. • Exclusion criterion: NSTEMI with orders to withhold life support.
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • Braunwald E, Antman EM, Beasley JW, Califf RM, Cheitlin MD, Hochman JS, Jones RH, Kereiakes D, Kupersmith J, Levin TN, Pepine CJ, Schaeffer JW, Smith EE 3rd, Steward DE, Theroux P, Alpert JS, Eagle KA, Faxon DP, Fuster V, Gardner TJ, Gregoratos G, Russell RO, Smith SC Jr. ACC/AHA guidelines for the management of patients with unstable angina and non-ST-segment elevation myocardial infarction. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on the Management of Patients with Unstable Angina). J Am Coll Cardiol. 2000 Sep; 36(3):970-1062.

Indicator number 4

Name of the indicator	RISK STRATIFICATION IN NON-ST-ELEVATION MYOCARDIAL INFARCTION (NSTEMI)
Dimension	Effectiveness and risk
Justification	The correct use of glycoprotein IIb/IIIa inhibitors makes it necessary to evaluate the risk to the patient. Various scientific societies (SEMICYUC, SEC, European Society of Cardiology, and American College of Cardiology/American Heart Association) recommend stratifying the risk to know the prognosis better. NSTEMI population registries determine which risk model should be used.
Formula	No. of patients with NSTEMI classified according to risk ---------- x100 No. of patients with NSTEMI
Explanation of the terminology	Classified according to risk: assignment to a risk group in function of a validated scale
Population	All patients with NSTEMI discharged from critical care during the period reviewed
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Antman EM, Cohen M, Bernink PJ, McCabe CH, Horacek T, Papuchis G, Mautner B, Corbalan R, Radley D, Braunwald E.The TIMI risk score for unstable angina/non-ST elevation MI: A method for prognostication and therapeutic decision making. JAMA. 2000 Aug 16; 284(7):835-42. • Boersma E, Pieper KS, Steyerberg EW, Wilcox RG, Chang WC, Lee KL, Akkerhuis KM, Harrington RA, Deckers JW, Armstrong PW, Lincoff AM, Califf RM, Topol EJ, Simoons ML.Predictors of outcome in patients with acute coronary syndromes without persistent ST-segment elevation. Results from an international trial of 9461 patients. The PURSUIT Investigators. Circulation. 2000 Jun 6; 101(22):2557-67. • Peterson ED, Pollack CV Jr, Roe MT, Parsons LS, Littrell KA, Canto JG, Barron HV; National Registry of Myocardial Infarction (NRMI) 4 Investigators. Early use of glycoprotein IIb/IIIa inhibitors in non-ST-elevation acute myocardial infarction: observations from the National Registry of Myocardial Infarction 4. J Am Coll Cardiol. 2003 Jul 2; 42(1):45-53. • Societies that recommend stratifying risk: SEMICYUC, SEC (2002-Rev Española Cardiología), European Society of Cardiology (2002-Europ Heart J), American College of Cardiology/American Heart Association.

Indicator number 5

Name of the indicator	DOOR-NEEDLE TIME IN ST-ELEVATION MYOCARDIAL INFARCTION (STEMI)
Dimension	Effectiveness and risk
Justification	Early administration of fibrinolytic agents in STEMI when indicated reduces the size of the infarction, improves residual ventricular function, and reduces morbidity and mortality.
Formula	$\frac{\text{No. of patients with STEMI and indication for fibrinolytic treatment and door-needle time} \leq 30 \text{ minutes}}{\text{No. of patients with STEMI}} \times 100$
Explanation of the terminology	• Door-needle time: time from entry in emergency department to start of fibrinolytic treatment • Fibrinolytic treatment prior to arrival at emergencies is also considered correct
Population	All patients with STEMI and indicated fibrinolytic treatment discharged from critical care during the period reviewed. Exclusion criteria: patients undergoing primary angioplasty.
Type	Process
Source of data	Clinical records or ARIAM (Analysis of Delay in Acute Myocardial Infarction) program
Standard	100%
Commentaries	References: • Marciniak TA, Ellerbeck EF, Radford MJ, Kresowik TF, Gold JA, Krumholz HM, Kiefe CI, Allman RM, Vogel RA, Jencks SF. Improving the quality of care for Medicare patients with acute myocardial infarction: results from the Cooperative Cardiovascular Project. JAMA. 1998 May 6;279(17):1351-7 • Aguayo E, Reina A, Colmenero M, Barranco M, Pola Gallego MD, Jiménez MM, and ARIAM Group. Analysis of delays in the treatment of acute coronary syndrome. Data in the registry ARIAM. [Article in Spanish]. Med Intensiva 1999; 23:280-7. • Iglesias ML, Pedro-Botet J, Hernandez E, Solsona JF, Molina L, Alvarez A, Auguet T. Fibrinolytic treatment in acute myocardial infarction: analysis of delay. [Article in Spanish].Med Clin (Barc). 1996 Mar 2;106(8):281-4. • González F, Guerrero FJ, Martínez JF, Vicente J, Martín JC, Ortiz AM and ARIAM Group. Fibrinolytic agents in the Proyecto ARIAM. Exclusions reasons and complications. [Article in Spanish].Med Intensiva 1999; 23:294-300.

Indicator number 6 (fundamental indicator)

Name of the indicator	EARLY REPERFUSION TECHNIQUES IN ST-ELEVATION MYOCARDIAL INFARCTION (STEMI)
Dimension	Effectiveness, risk, and appropriateness
Justification	Reperfusion using fibrinolytic treatment or primary percutaneous transluminal coronary angioplasty (PTCA) reduces mortality in patients with STEMI.
Formula	No. of patients with STEMI and early reperfusion ---------- x100 No. of patients with STEMI
Explanation of the terminology	• early reperfusion: performing -- fibrinolytic treatment within 6 hrs of onset of pain --coronary angiography +/- PTCA within 12 hrs of onset of pain
Population	All patients with STEMI discharged from critical care during the period reviewed • Exclusion criteria: STEMI with orders to withhold life support
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Marciniak TA, Ellerbeck EF, Radford MJ, Kresowik TF, Gold JA, Krumholz HM, Kiefe CI, Allman RM, Vogel RA, Jencks SF. Improving the quality of care for Medicare patients with acute myocardial infarction: results from the Cooperative Cardiovascular Project. JAMA. 1998 May 6;279(17):1351-7 **Type A evidence** • ACC/AHA guidelines for the management of patients with ST-elevation myocardial infarction--executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 1999 Guidelines for the Management of Patients With Acute Myocardial Infarction). Circulation. 2004 Aug 3; 110(5):588-636.

Indicator number 7

Name of the indicator	HOSPITAL MORTALITY IN ST-ELEVATION MYOCARDIAL INFARCTION (STEMI)
Dimension	Risk
Justification	Although mortality due to MI depends on many factors, it seems to be greatly influenced by the treatments received, which is why it continues to be an indicator of quality.
Formula	$\frac{\text{No. of patients discharged from ICU with main diagnosis of STEMI dying in-hospital}}{\text{No. of patients discharged from ICU with main diagnosis of STEMI}} \times 100$
Explanation of the terminology	Death should be considered in-hospital whether in ICU or other department after discharge from ICU
Population	All patients with main diagnosis of STEMI discharged from critical care (to another ward, to their homes, or death) during the period reviewed • Exclusion criterion: patients translated to other hospitals (due to difficulties in follow-up) Patients with secondary diagnosis of STEMI are not included because the references supporting the standard only consider those with STEMI as a primary diagnosis
Type	Outcome
Source of data	Clinical records
Standard	12% (if higher, the results must be reviewed using the risk-adjusted rate)
Commentaries	References: • Marciniak TA, Ellerbeck EF, Radford MJ, Kresowik TF, Gold JA, Krumholz HM, Kiefe CI, Allman RM, Vogel RA, Jencks SF. Improving the quality of care for Medicare patients with acute myocardial infarction: results from the Cooperative Cardiovascular Project. JAMA. 1998 May 6; 279(17):1351-7. • Reina A, Aguayo E, Colmenero M, Camacho A, Medina P, Fernández MA and ARIAM Group. Mortality in acute myocardial infarction. [Article in Spanish].Med Intensiva 1999; 23:288-93.

Indicator number 8

Name of the indicator	EARLY TREATMENT OF CARDIOVASCULAR DYSFUNCTION (CD)
Dimension	Effectiveness and risk
Justification	CD affects a high percentage of ICU patients and can start at any time during their evolution. Early clinical detection and treatment of CD improves their prognosis. Furthermore, it involves no diagnostic or therapeutic procedures (it is noninvasive) and does not increase the cost of treatment.
Formula	No. of episodes of CD with early treatment ---------- x100 Total no. of episodes of CD
Explanation of the terminology	• (acute) CD: patient requires treatment with vasoactive amines to maintain mean arterial pressure $\geq$ 70mmHg. Cardiovascular SOFA > 1 is considered to be CD. • Early treatment: administration of amines within 1 hr of onset of hypotension (MAP $\leq$ 70) once blood volume has been normalized.
Population	All episodes of CD discharged from the ICU during the period reviewed
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	The authors recommend measuring this indicator by means of daily samples until enough cases have been compiled. References: • Vincent JL, de Mendonca A, Cantraine F, Moreno R, Takala J, Suter PM, Sprung CL, Colardyn F, Blecher S.Use of the SOFA score to assess the incidence of organ dysfunction/failure in intensive care units: results of a multicenter, prospective study. Working group on "sepsis-related problems" of the European Society of Intensive Care Medicine. Crit Care Med. 1998 Nov;26(11):1793-800 • Ferreira FL, Bota DP, Bross A, Melot C, Vincent JL. Serial evaluation of the SOFA score to predict outcome in critically ill patients. JAMA. 2001 Oct 10; 286(14):1754-8. • Rivers E, Nguyen B, Havstad S, Ressler J, Muzzin A, Knoblich B, Peterson E, Tomlanovich M; Early Goal-Directed Therapy Collaborative Group. Early goal-directed therapy in the treatment of severe sepsis and septic shock. N Engl J Med. 2001 Nov 8; 345(19):1368-77.

Indicator number 9

Name of the indicator	THERAPEUTIC HYPOTHERMIA AFTER CARDIAC ARREST (CA)
Dimension	Effectiveness and risk
Justification	Mild therapeutic hypothermia induced after cardiac arrest (CA) due to ventricular fibrillation (VF) or ventricular tachycardia (VT) without pulse in patients persisting in coma after recovering circulation has been shown to improve neurologic prognosis and reduce mortality (Recommendation Grade A, Level I evidence)
Formula	No. of patients with CA due to VF or VT without pulse and induced hypothermia ---------- x100 No. of patients with CA due to VF or VT without pulse
Explanation of the terminology	Therapeutic hypothermia: Induction of mild hypothermia ($33 \pm 1^{o}C$) within 4 hrs of cardiac arrest.
Population	All patients with CA due to VF or VT without pulse during the period reviewed • Inclusion criterion: persistence in coma after restoration of circulation • Exclusion criteria: -- cardiogenic shock –malignant arrhythmias –pregnancy –coagulopathy
Type	Process
Source of data	Clinical records
Standard	90%
Commentaries	References: • Holzer M, Bernard SA, Hachimi-Idrissi S, Roine RO, Sterz F, Mullner M; on behalf of the Collaborative Group on Induced Hypothermia for Neuroprotection after Cardiac Arrest. Hypothermia for neuroprotection after cardiac arrest: Systematic review and individual patient data meta-analysis. Crit Care Med 2005 Feb; 33(2):414-8. • Bernard SA, Gray TW, Buist MD, Jones BM, Silvester W, Gutteridge G, Smith K. Treatment of comatose survivors of out-of-hospital cardiac arrest with induced hypothermia. N Engl J Med. 2002 Feb 21; 346(8):557-63. • Hypothermia after Cardiac Arrest Study Group. Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest. N Engl J Med. 2002 Feb 21; 346(8):549-56. • De la Cal MA, Latour J, de los Reyes M, Palencia E. Recomendaciones de la 6ª Conferencia de Consenso de la SEMICYUC. Estado vegetativo persistente postanoxia en el adulto. Med Intensiva 2003; 27(8):544-55.

Indicator number 10

Name of the indicator	USE OF THE UTSTEIN TEMPLATE
Dimension	Appropriateness
Justification	Data collection after cardiorespiratory arrest (CRA) enables statistical analysis of in-hospital morbidity and mortality. The Utstein style is a uniform system of data recollection that allows the healthcare response to CRA to be known precisely, improved, and compared between centers.
Formula	$\frac{\text{No. of CRA alerts and Utstein template correctly completed}}{\text{No. of CRA alerts}} \times 100$
Explanation of the terminology	• Utstein template correctly completed: All template variables completed • CRA alert: includes CRA with or without Emergency Code (EC) activation and CRA with unjustified activation of EC This indicator is only applicable to critical care departments that form part of the hospital's CRA resuscitation team
Population	All CRA alerts attended at the hospital during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Peberdy MA, Kaye W, Ornato JP, Larkin GL, Nadkarni V, Mancini ME, Berg RA, Nichol G, Lane-Trultt T.Cardiopulmonary resuscitation of adults in the hospital: a report of 14720 cardiac arrests from the National Registry of Cardiopulmonary Resuscitation. Resuscitation. 2003 Sep;58(3):297-308. • Niemann JT, Stratton SJ.The Utstein template and the effect of in-hospital decisions: the impact of do-not-attempt resuscitation status on survival to discharge statistics. Resuscitation. 2001 Dec; 51(3):233-7. • Cummins RO, Chamberlain D, Hazinski MF, Nadkarni V, Kloeck W, Kramer E, Becker L, Robertson C, Koster R, Zaritsky A, Bossaert L, Ornato JP, Callanan V, Allen M, Steen P, Connolly B, Sanders A, Idris A, Cobbe S. Recommended guidelines for reviewing, reporting, and conducting research on in-hospital resuscitation: the in-hospital 'Utstein style'. American Heart Association. Circulation. 1997 Apr 15; 95(8):2213-39. • Colmenero M, de la Chica R, Chavero MJ, Pérez JM, Reina A, Rodríguez M. Outcome after cardiorespiratory arrest in a referral hospital reported in Utstein style. [Article in Spanish].Med Intensitva 2004; 28:49-56.

Indicator number 11

Name of the indicator	PERIOPERATIVE MYOCARDIAL INFARCTION (MI) IN HEART SURGERY
Dimension	Risk
Justification	Perioperative MI after coronary revascularization surgery is a serious complication and one of the most common causes of morbidity and mortality in these patients. It has also been associated with increased length of stay.
Formula	No. of patients with diagnosis of perioperative MI ---------- x100 No. of patients discharged from ICU after coronary revascularization surgery
Explanation of the terminology	The diagnosis of perioperative MI will be made according to standardized criteria in each unit (a or b): • a) ST changes + appearance of a new Q wave (>30msec or 0.1mV in 2 contiguous derivations) + total CK mb > 40 UI/I (Minnesota criteria) and suggestive echocardiographic findings • b) Troponin > 10ng/ml 10 hrs after clamping
Population	All patients discharged from critical care after coronary revascularization surgery during the period reviewed • Exclusion criterion: emergency surgery and coronary revascularization surgery together with valve replacement
Type	Outcome
Source of data	Clinical records
Standard	10%
Commentaries	References: The authors warn that this indicator could have a reliability bias when used for comparison with other centers, as the results can be affected by the standardized diagnostic criteria used at each center. • Castro Martinez J, Vazquez Rizaldos S, Velayos Amo C, Herranz Valera J, Almeria Varela C, Iloro Mora MI. Cardiac troponin I in perioperative myocardial infarction after coronary artery bypass surgery. [Article in Spanish].Rev Esp Cardiol. 2002 Mar;55(3):245-50

Indicator number 12

Name of the indicator	INCIDENCE OF EARLY COMPLICATIONS IN THE IMPLANTATION OF PERMANENT PACEMAKERS (PP)
Dimension	Risk
Justification	The appearance of complications in patients in whom PP are implanted is associated to increased mortality.
Formula	No. of patients with complications after PP implantation ---------- x100 No. of patients undergoing PP implantation
Explanation of the terminology	The following are considered to be early complications: • cavity perforations • electrode dislocation • pneumothorax • arterial puncture PP infection is not included because it is considered to be a late complication.
Population	All patients discharged from critical care after PP implantation during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	2%
Commentaries	References: • Trohman RG, Kim MH, Pinski SL. Cardiac pacing: the state of the art. Lancet. 2004 Nov 6-12; 364(9446):1701-19. • Grupo de Trabajo de Cuidados Intensivos Cardiológicos y RCP. Informe de registro MAMI 2003. www.semicyuc.org

Indicator number 13

Name of the indicator	INCIDENCE OF BAROTRAUMA
Dimension	Risk
Justification	The appearance of barotrauma in patients on mechanical ventilation is independently associated to increased risk of death.
Formula	$\frac{\text{No. of patients with barotrauma}}{\text{No. of patients with invasive mechanical ventilation}} \times 100$
Explanation of the terminology	The presence of at least one of the following findings in relation with mechanical ventilation is considered to be the appearance of barotrauma: • Interstitial emphysema • Pneumothorax • Pneumomediastinum • Subcutaneous emphysema
Population	All patients on mechanical ventilation > 12 hrs during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	5%
Commentaries	References: • Esteban A, Anzueto A, Frutos F, Alia I, Brochard L, Stewart TE, Benito S, Epstein SK, Apezteguia C, Nightingale P, Arroliga AC, Tobin MJ; Mechanical Ventilation International Study Group. Characteristics and outcomes in adult patients receiving mechanical ventilation: a 28-day international study. JAMA. 2002 Jan 16; 287(3):345-55. • Anzueto A, Frutos-Vivar F, Esteban A, Alia I, Brochard L, Stewart T, Benito S, Tobin MJ, Elizalde J, Palizas F, David CM, Pimentel J, Gonzalez M, Soto L, D'Empaire G, Pelosi P. Incidence, risk factors and outcome of barotrauma in mechanically ventilated patients. Intensive Care Med. 2004 Apr; 30(4):612-9.

Indicator number 14

Name of the indicator	VENTILATOR CIRCUIT CHANGE AT 7 DAYS
Dimension	Risk and efficiency
Justification	Circuit change in mechanical ventilation (MV) before 7 days is not associated to a decrease in pneumonia. On the contrary, this practice is associated with increased incidence of pneumonia as well as higher costs.
Formula	$\frac{\text{No. of circuits used}}{\text{Total no. of days of MV/7}} \times 100$
Explanation of the terminology	Days of MV/7: represents the total number of 7-day blocks of MV.
Population	All patients undergoing MV during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	>90%
Commentaries	References: • Stamm AM. Ventilator-associated pneumonia and frequency of circuit changes. Am J Infect Control. 1998 Feb; 26(1):71-3. • Han JN, Liu YP, Ma S, Zhu YJ, Sui SH, Chen XJ, Luo DM, Adams AB, Marini JJ.Effects of decreasing the frequency of ventilator circuit changes to every 7 days on the rate of ventilator-associated pneumonia in a Beijing hospital. Respir Care. 2001 Sep; 46(9):891-6.

Indicator number 15

Name of the indicator	SERIOUS COMPLICATIONS DURING PRONE POSITION IN ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS)
Dimension	Risk
Justification	Position change to prone in patients with ARDS significantly improves oxygenation, permitting safer parameters in mechanical ventilation, although no significant reduction in mortality has been demonstrated. Although the appearance of complications associated to this technique is very low, it is advisable to monitor their appearance.
Formula	$\frac{\text{No. of patients with ARDS and serious complications after prone positioning}}{\text{No. of patients with ARDS placed in prone position}} \times 100$
Explanation of the terminology	The following are considered to be serious complications: • accidental extubation • accidental withdrawal of intravascular catheters • decubitus ulcers (related with the prone position)
Population	All patients placed in the prone position, whether for acute pulmonary lesion or ARDS, during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	< 2%
Commentaries	References: • Gattinoni L, Tognoni G, Pesenti A, Taccone P, Mascheroni D, Labarta V, Malacrida R, Di Giulio P, Fumagalli R, Pelosi P, Brazzi L, Latini R; Prone-Supine Study Group. Effect of prone positioning on the survival of patients with acute respiratory failure. N Engl J Med. 2001 Aug 23; 345(8):568-73. • Pelosi P, Brazzi L, Gattinoni L. Prone position in acute respiratory distress syndrome. Eur Respir J. 2002 Oct; 20(4):1017-28. • Rialp G, Mancebo J. Prone positioning in patients with acute respiratory distress syndrome. Respir Care Clin N Am. 2002 Jun; 8(2):237-45.

Indicator number 16

Name of the indicator	SPONTANEOUS BREATHING TRIAL
Dimension	Risk and efficiency
Justification	The availability of a protocol for weaning from mechanical ventilation (MV) significantly shortens the total time under MV, thus reducing the associated risks. The use of daily trials to check tolerance to spontaneous breathing in mechanically ventilated patients significantly shortens the total time under MV.
Formula	No. of MV patients with daily spontaneous breathing trials ---------- x100 Total No. of MV patients
Explanation of the terminology	• Weaning trial: scheduled attempt to disconnect the ventilator by means of a spontaneous breathing trial using any of the following: o T-tube test o Use of 7cm H2O pressure support ventilation (PSV) o Continuous positive airway pressure (CPAP) 5 cm H2O • Synchronized intermittent mandatory ventilation (SIMV) is specifically excluded.
Population	All patients intubated during the period reviewed that meet the following criteria: • Resolution of the underlying disease • Adequate pH and oxygenation • Temperature < 38 ^{0} C • Hemodynamic stability without need for high doses of vasoactive amines • Adequate functioning of respiratory musculature • Correct metabolic and hydroelectric states • Absence of delirium or anxiety
Type	Process
Source of data	Clinical records
Standard	55%
Commentaries	The authors consider it more practical to measure the indicator by choosing "patients with MV" to be the unit of analysis rather than "days of MV" because weaning tests are not usually registered in IT systems, and this approach facilitates the application of the exclusion criteria. We recommended evaluating whether the trial has been performed daily in those patients meeting the above-mentioned inclusion criteria. References: • Cook D, Meade M, Guyatt G, Griffith L, Booker L. Criteria for weaning from mechanical ventilation. Evid Rep Technol Assess (Summ). 2000 Jun;(23):1-4. • Saura P, Blanch L, Mestre J, Valles J, Artigas A, Fernandez R. Clinical consequences of the implementation of a weaning protocol. Intensive Care Med. 1996 Oct; 22(10):1052-6. • Esteban A, Frutos F, Tobin MJ, Alia I, Solsona JF, Valverdu I, Fernandez R, de la Cal MA, Benito S, Tomas R, et al. A comparison of four methods of weaning patients from mechanical ventilation. Spanish Lung Failure Collaborative Group. N Engl J Med. 1995 Feb 9;332(6):345-50 • Esteban A, Alia I, Tobin MJ, Gil A, Gordo F, Vallverdu I, Blanch L, Bonet A, Vazquez A, de Pablo R, Torres A, de La Cal MA, Macias S. Effect of spontaneous breathing trial duration on outcome of attempts to discontinue mechanical ventilation. Spanish Lung Failure Collaborative Group. Am J Respir Crit Care Med. 1999 Feb; 159(2):512-8.

Indicator number 17

Name of the indicator	SELECTIVE DECONTAMINATION OF DIGESTIVE TRACT (DDT) IN PATIENTS AT RISK
Dimension	Risk and efficiency
Justification	The use of DDT in patients needing mechanical ventilation (MV) for > 48 hrs has been shown to reduce mortality and length of ICU stay.
Formula	No. of patients with MV > 48 hrs treated with DDS ---------- x100 Total no. patients with MV > 48 hrs
Explanation of the terminology	• DDS consists of a combination of topical treatment (antibiotic paste applied in the oral cavity and antibiotic solution administered through the nasogastric tube) during the period of mechanical ventilation, together with IV cefotaxime during the first four days. • Patients at risk: patients undergoing mechanical ventilation in whom MV > 48 hrs is foreseen.
Population	• All patients undergoing MV > 48 hrs. during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	80%
Commentaries	References: • de Jonge E, Schultz MJ, Spanjaard L, Bossuyt PM, Vroom MB, Dankert J, Kesecioglu J.Effects of selective decontamination of digestive tract on mortality and acquisition of resistant bacteria in intensive care: a randomised controlled trial. Lancet. 2003 Sep 27; 362(9389):1011-6. • Liberati A, D'Amico R, Pifferi, Torri V, Brazzi L. Antibiotic prophylaxis to reduce respiratory tract infections and mortality in adults receiving intensive care. Cochrane Database Syst Rev. 2004;(1):CD000022 • Parra Moreno ML, Arias Rivera S, la Cal Lopez MA, Frutos Vivar F, Cerda Cerda E, Garcia Hierro P, Negro Vega E. Effect of selective digestive decontamination on the nosocomial infection and multiresistant microorganisms incidence in critically ill patients. [Article in Spanish].Med Clin (Barc). 2002 Mar 23; 118(10):361-4.

Indicator number 18

Name of the indicator	LIMITED ALVEOLAR PRESSURE (P PLATEAU) IN INVASIVE MECHANICAL VENTILATION (MV)
Dimension	Risk and effectiveness
Justification	In patient populations requiring MV for whatever reason, the use of high pressures (P plateau) is associated to increased incidence of barotraumas and risk of death.
Formula	$\frac{\text{No. of patients with P plateau} > 30 \text{ cm } H_2O}{\text{No. patients with invasive MV}} \times 100$
Explanation of the terminology	Sustained P plateau > 30 cm H2O: values above 30 cm H2O for more than one consecutive hour.
Population	All patients undergoing invasive MV > 12 hrs. during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	10%
Commentaries	The authors recommend measuring this indicator by means of daily samples. References: • Esteban A, Anzueto A, Frutos F, Alia I, Brochard L, Stewart TE, Benito S, Epstein SK, Apezteguia C, Nightingale P, Arroliga AC, Tobin MJ; Mechanical Ventilation International Study Group. Characteristics and outcomes in adult patients receiving mechanical ventilation: a 28-day international study. JAMA. 2002 Jan 16; 287(3):345-55. • Petrucci N. Tidal volumes in ARDS and meta-analysis. Am J Respir Crit Care Med. 2003 Mar 15; 167(6):935-6. • Moran JL, Bersten AD, Solomon PJ. Meta-analysis of controlled trials of ventilator therapy in acute lung injury and acute respiratory distress syndrome: an alternative perspective. Intensive Care Med. 2005 Feb; 31(2):227-35. • Dellinger RP, Carlet JM, Masur H, Gerlach H, Calandra T, Cohen J, Gea-Banacloche J, Keh D, Marshall JC, Parker MM, Ramsay G, Zimmerman JL, Vincent JL, Levy MM. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. Intensive Care Med. 2004 Apr; 30(4):536-55.

Indicator number 19

Name of the indicator	LIMITED MAXIMUM INSPIRATORY PRESSURE (P PEAK) IN INVASIVE MECHANICAL VENTILATION
Dimension	Risk and effectiveness
Justification	In patient populations requiring MV for whatever reason, monitoring maximum inspiratory pressures (P peak) helps detect high pressures associated to increased incidence of barotraumas and other ventilatory problems that put the patient's life at risk.
Formula	No. of patients with P peak > 50 cm H2O ---------- x100 Total no. patients with invasive MV
Explanation of the terminology	• P peak > 50 cm H2O: P peak maintained above 50 cm H2O for more than one hour.
Population	• All patients requiring MV > 12 hrs. during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	10%
Commentaries	References: The authors recommend measuring this indicator by means of daily samples. • Esteban A, Anzueto A, Frutos F, Alia I, Brochard L, Stewart TE, Benito S, Epstein SK, Apezteguia C, Nightingale P, Arroliga AC, Tobin MJ; Mechanical Ventilation International Study Group. Characteristics and outcomes in adult patients receiving mechanical ventilation: a 28-day international study. JAMA. 2002 Jan 16; 287(3):345-55. • Petrucci N. Tidal volumes in ARDS and meta-analysis. Am J Respir Crit Care Med. 2003 Mar 15; 167(6):935-6.

Indicator number 20 (fundamental indicator)

Name of the indicator	SEMIRECUMBENT POSITION IN PATIENTS UNDERGOING INVASIVE MECHANICAL VENTILATION (MV)
Dimension	Risk and effectiveness
Justification	The semirecumbent position reduces the incidence of pneumonia associated to mechanical ventilation (MV).
Formula	$\frac{\text{No. of days invasive MV and position} \geq 30^{o}}{\text{No. of days invasive MV}} \times 100$
Explanation of the terminology	Semirecumbent position: position maintaining an angle $\geq 30^{o}$.
Population	All patients requiring MV during the period reviewed. Exclusion criteria: • patients ventilated in the prone position • clinical contraindications
Type	Process
Source of data	ICU clinical records
Standard	97%
Commentaries	The authors recommend measuring this indicator by means of daily samples. References: • Drakulovic MB, Torres A, Bauer TT, Nicolas JM, Nogue S, Ferrer M. Supine body position as a risk factor for nosocomial pneumonia in mechanically ventilated patients: a randomised trial. Lancet. 1999 Nov 27; 354(9193):1851-8. • Torres A, Serra-Batlles J, Ros E, Piera C, Puig de la Bellacasa J, Cobos A, Lomena F, Rodriguez-Roisin R.Pulmonary aspiration of gastric contents in patients receiving mechanical ventilation: the effect of body position. Ann Intern Med. 1992 Apr 1; 116(7):540-3. • Dellinger RP, Carlet JM, Masur H, Gerlach H, Calandra T, Cohen J, Gea-Banacloche J, Keh D, Marshall JC, Parker MM, Ramsay G, Zimmerman JL, Vincent JL, Levy MM. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. Intensive Care Med. 2004 Apr; 30(4):536-55.

Indicator number 21

Name of the indicator	CHANGING HEAT-AND-MOISTURE EXCHANGERS
Dimension	Risk and effectiveness
Justification	In the absence of malfunction or fouling, changing heat-and-moisture exchangers is not indicated before 48 hrs. Unnecessary or early replacement can influence the number of pneumonias associated to mechanical ventilation (MV).
Formula	$\frac{\text{No. of patients with heat-and-moisture exchanger and appropriate changing}}{\text{No. of patients with heat-and-moisture exchanger}} \times 100$
Explanation of the terminology	Appropriate replacement: Indications for changing: • > 48 hrs • Malfunctioning • Fouling
Population	All patients with heat-and-moisture exchangers during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Boisson C, Viviand X, Arnaud S, Thomachot L, Miliani Y, Martin C. Changing a hydrophobic heat and moisture exchanger after 48 hours rather than 24 hours: a clinical and microbiological evaluation. Intensive Care Med. 1999 Nov; 25(11):1237-43. • Salemi C, Padilla S, Canola T, Reynolds D. Heat-and-moisture exchangers used with biweekly circuit tubing changes: effect on costs and pneumonia rates. Infect Control Hosp Epidemiol. 2000 Nov; 21(11):737-9.

Indicator number 22 (fundamental indicator)

Name of the indicator	PREVENTION OF THROMBOEMBOLISM
Dimension	Risk
Justification	The use of prophylactic measures against deep vein thromboembolism (DVTE) during the ICU stay is associated to a decrease in morbidity and mortality due to thromboembolism.
Formula	$\frac{\text{No. of patients receiving prophylaxis against DVTE}}{\text{No. of patients admitted}} \times 100$
Explanation of the terminology	Prophylaxis against DVTE: Use during ICU stay of: • Fractionated heparin • Unfractionated heparin • Fondaparinux • Complete anticoagulation • Devices (pneumatic or other) for compressing the lower limbs
Population	All patients discharged from the ICU during the period reviewed. Exclusion criteria: • Absolute: patients admitted for procedures requiring hospitalization $\leq$1 day. • For the use of pharmacologic prophylaxis: contraindications for anticoagulants • For the use of mechanical measures: lower limb lesions
Type	Process
Source of data	Clinical records
Standard	90%
Commentaries	The authors recommend measuring this indicator by periods. References: • Geerts WH, Pineo GF, Heit JA, Bergqvist D, Lassen MR, Colwell CW, Ray JG. Prevention of venous thromboembolism: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. Chest. 2004 Sep; 126(3 Suppl):338S-400S. • Dellinger RP, Carlet JM, Masur H, Gerlach H, Calandra T, Cohen J, Gea-Banacloche J, Keh D, Marshall JC, Parker MM, Ramsay G, Zimmerman JL, Vincent JL, Levy MM. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. Intensive Care Med. 2004 Apr; 30(4):536-55.

Indicator number 23

Name of the indicator	UNPLANNED EXTUBATION
Dimension	Risk
Justification	Unplanned extubation is associated to a high rate of reintubation and with increased risk of nosocomial pneumonia and death.
Formula	$\frac{\text{No. of unplanned extubations}}{\text{Total no. of days of intubation}} \times 1000$
Explanation of the terminology	Unplanned extubation includes: • Accidental extubation: unforeseen or undesired extubation caused by malfunctioning of the tube itself (obstruction or breakage of the inflator cuff) or by inappropriate maneuver by professionals. • Self-extubation: unforeseen or undesired extubation caused by the patient himself.
Population	All days of intubation of patients that require ventilatory support through an endotracheal tube during the period of review.
Type	Outcome
Source of data	Clinical records
Standard	15 episodes per 1000 days intubation
Commentaries	References: • Esteban A, Anzueto A, Frutos F, Alia I, Brochard L, Stewart TE, Benito S, Epstein SK, Apezteguia C, Nightingale P, Arroliga AC, Tobin MJ; Mechanical Ventilation International Study Group. Characteristics and outcomes in adult patients receiving mechanical ventilation: a 28-day international study. JAMA. 2002 Jan 16; 287(3):345-55. • Betbese AJ, Perez M, Bak E, Rialp G, Mancebo J. A prospective study of unplanned endotracheal extubation in intensive care unit patients.Crit Care Med. 1998 Jul; 26(7):1180-6. • Goñi Viguria R, Garcia Santolaya MP, Vazquez Calatayud M, Margall Coscojuela MA, Asiain Erro MC. Evaluation of care quality in the ICU through a computerized nursing care plan. [Article in Spanish]. Enferm Intensiva. 2004 Apr-Jun; 15(2):76-85. • Marcos M, Ayuso D, Gonzalez B, Carrion MI, Robles P, Munoz F, de la Cal MA. Analysis of the accidental withdrawal of tubes, probes and catheters as a part of the program of quality control. [Article in Spanish]. Enferm Intensiva. 1994 Jul-Sep; 5(3):115-20.

Indicator number 24

Name of the indicator	REINTUBATION
Dimension	Risk and effectiveness
Justification	Reintubation significantly increases morbidity and mortality in critical patients (pneumonia, infection, anatomic lesions, etc.)
Formula	$\frac{\text{No. of reintubations}}{\text{Total no. of scheduled extubations}} \times 100$
Explanation of the terminology	Reintubation: the need to reintube during the first 48 hours after extubation
Population	All planned extubations during the period reviewed. • Exclusion criterion: extubations to withdraw life support
Type	Outcome
Source of data	ICU clinical records
Standard	12%
Commentaries	The authors also point out that a low rate of reintubation might indicate excessively long mechanical ventilation times. References: • Esteban A, Frutos F, Tobin MJ, Alia I, Solsona JF, Valverdu I, Fernandez R, de la Cal MA, Benito S, Tomas R, et al. A comparison of four methods of weaning patients from mechanical ventilation. Spanish Lung Failure Collaborative Group. N Engl J Med. 1995 Feb 9; 332(6):345-50. • Esteban A, Alia I, Tobin MJ, Gil A, Gordo F, Vallverdu I, Blanch L, Bonet A, Vazquez A, de Pablo R, Torres A, de La Cal MA, Macias S.Effect of spontaneous breathing trial duration on outcome of attempts to discontinue mechanical ventilation. Spanish Lung Failure Collaborative Group. Am J Respir Crit Care Med. 1999 Feb; 159(2):512-8. • Esteban A, Alia I, Gordo F, Fernandez R, Solsona JF, Vallverdu I, Macias S, Allegue JM, Blanco J, Carriedo D, Leon M, de la Cal MA, Taboada F, Gonzalez de Velasco J, Palazon E, Carrizosa F, Tomas R, Suarez J, Goldwasser RS.Extubation outcome after spontaneous breathing trials with T-tube or pressure support ventilation. The Spanish Lung Failure Collaborative Group. Am J Respir Crit Care Med. 1997 Aug; 156(2 Pt 1):459-65.

Indicator number 25

Name of the indicator	EARLY IMPLEMENTATION OF NONINVASIVE MECHANICAL VENTILATION ON EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)
Dimension	Effectiveness and efficiency
Justification	The use of noninvasive mechanical ventilation (MV) on exacerbation of COPD has been shown to reduce mortality, hospital stay, the need for orotracheal intubation, and to increase the success of treatment.
Formula	$\frac{\text{No. of patients diagnosed of exacerbation of COPD treated with early noninvasive MV}}{\text{Total no. of patients diagnosed of exacerbation of COPD}} \times 100$
Explanation of the terminology	Early noninvasive MV: initiated within 2 hrs of admission
Population	All patients with diagnosis of exacerbated COPD during the period reviewed. Exclusion criterion: contraindications for noninvasive MV • coma • unable to tolerate the technique • facial lesions that contraindicate the use of the mask
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	Reference: • Lightowler JV, Wedzicha JA, Elliott MW, Ram FS.Non-invasive positive pressure ventilation to treat respiratory failure resulting from exacerbations of chronic obstructive pulmonary disease: Cochrane systematic review and meta-analysis. BMJ. 2003 Jan 25; 326(7382):185.

Indicator number 26

Name of the indicator	LOW TIDAL VOLUME DURING INVASIVE MECHANICAL VENTILATION IN ACUTE LUNG INJURY
Dimension	Risk
Justification	High tidal volume increases morbidity and mortality in patients undergoing invasive MV.
Formula	$\frac{\text{No. of patients ventilated with tidal volume} \leq \text{8ml/Kg ideal weight}}{\text{No. of patients with acute lung injury undergoing invasive MV}} \times 100$
Explanation of the terminology	Acute lung injury: lung lesion together with Pa/FIO2<300 regardless of PEEP and that meets the criteria of the Consensus Congress (1)
Population	Patients diagnosed of acute lung injury undergoing invasive MV in the ICU during the period reviewed.
Type	Process
Source of data	ICU clinical records
Standard	95%
Commentaries	References: • (1) Bernard GR, Artigas A, Brigham KL, Carlet J, Falke K, Hudson L, Lamy M, Legall JR, Morris A, Spragg R. The American-European Consensus Conference on ARDS. Definitions, mechanisms, relevant outcomes, and clinical trial coordination. Am J Respir Crit Care Med. 1994 Mar; 149(3 Pt 1):818-24. • Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. The Acute Respiratory Distress Syndrome Network. N Engl J Med. 2000 May 4; 342(18):1301-8. • Brower RG, Rubenfeld GD. Lung-protective ventilation strategies in acute lung injury. Crit Care Med. 2003 Apr; 31(4 Suppl):S312-6.

Indicator number 27

Name of the indicator	EXAMINATION OF POTENTIALLY SEVERE TRAUMA (PST) PATIENTS BY INTENSIVISTS
Dimension	Effectiveness and risk
Justification	Examination by intensivists can improve care in patients with PST.
Formula	$\frac{\text{No. of patients with PST evaluated by an intensivist on admission}}{\text{No. of patients with PST in the hospital (emergencies and ICU)}} \times 100$
Explanation of the terminology	PST: Trauma causing serious lesions, expressed by a Revised Trauma Score (RTS)≤11 at triage and/or an Injury Severity Score (ISS) ≥ 16
Population	Patients with PST discharged from the hospital during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • García Delgado M, Navarrete Navarro P, Navarrete Sánchez I, Muñoz Sánchez MA, Rincón Ferrari MD, Grupo GITAN. Epdemiological and clinical manifestations of severe injuries in Andalucia. GITAN multicenter study. [Article in Spanish]. Med Intensiva, 2004, 28: 449-56 • Marco P. Asistencia al paciente politraumatizado: el liderazgo del intensivista. Med Intensiva 1999; 23:111-3. • Champion HR, Sacco WJ, Copes WS, Gann DS, Gennarelli TA, Flanagan ME. A revision of the Trauma Score. J Trauma. 1989 May; 29(5):623-9. • Baker SP, O'Neill B, Haddon W Jr, Long WB. The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. J Trauma. 1974 Mar; 14(3):187-96.

Indicator number 28

Name of the indicator	TRACHEAL INTUBATION WITHIN 8 HRS IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY AND GLASGOW COMA SCORE < 9
Dimension	Effectiveness
Justification	Inadequate control of hypoxemia in severe traumatic brain injury (TBI) increases secondary cerebral lesions, worsening prognosis for survival and function in these patients. Tracheal intubation in severe TBI is an indication established in clinical practice guides.
Formula	$\frac{\text{No. of patients with severe TBI intubated within 8 hrs}}{\text{No. of patients with severe TBI}} \times 100$
Explanation of the terminology	Severe TBI: GCS < 9. Within 8 hrs: time period from the accident to intubation
Population	Patients with severe TBI discharged from the ICU during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • Recommendations for the medical treatment of severe cranioencephalic trauma. Working group of Intensive Neurology of the Catalan Association of Intensive Health Care (Neuro-ACMI). [Article in Spanish].Med Clin (Barc). 2000 Apr 8;114(13):499-505 • Management and prognosis of severe traumatic brain injury. Guidelines for the management of severe traumatic brain injury. Brain Trauma Foundation 2000. J Neurotrauma 17:449-554. Available at: http://remi.uninet.edu/PAC/BTF.htm • Bullock R, Chesnut RM, Clifton G, Ghajar J, Marion DW, Narayan RK, Newell DW, Pitts LH, Rosner MJ, Wilberger JW.Guidelines for the management of severe head injury. Brain Trauma Foundation. Eur J Emerg Med. 1996 Jun; 3(2):109-27.

Indicator number 29 (fundamental indicator)

Name of the indicator	SURGICAL INTERVENTION IN TRAUMATIC BRAIN INJURY (HI) WITH SUBDURAL (SDH) AND/OR EPIDURAL HEMATOMA (EDH)
Dimension	Risk and effectiveness
Justification	Delays in surgical treatment of subdural and epidural hematomas in TBI with signs of intracranial hypertension are associated with worse outcomes and increased mortality.
Formula	No. of SDH/EDH with intracranial hypertension with surgical intervention within 2 hrs ---------- x100 No. of SDH/EDH with intracranial hypertension and indications for surgery
Explanation of the terminology	2 hrs: time period from CT examination (time stated on CT images) to surgery Indications for surgery: based on clinical criteria for intracranial hypertension and radiological criteria for EDH and SDH. • Clinical criteria: GCS < 9; focal deficit, anisocoric or dilated pupils; ICP > 20 mmHg • Radiological criteria: EDH: > 30 cc volume; > 5 mm midline displacement HS: > 10 mm thickness; > 5 mm displacement
Population	All patients with SDH / EDH and indications for surgical intervention discharged from the ICU during the period reviewed. • Exclusion criterion: patients with orders to withhold life support
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Surgical Management of Traumatic Brain Injury. Brain Trauma Foundation. 2002. Available at: http://remi.uninet.edu/PAC/BTF.htm • Quality Assurance Audit Filters of the Committee on Trauma of the American College of Surgeons.

Indicator number 30

Name of the indicator	USE OF CORTICOSTEROIDS IN TRAUMATIC BRAIN INJURY (HI)
Dimension	Risk
Justification	The administration of corticosteroids in the management of the acute phase of TBI is a common, deeply rooted practice. However, this practice has been linked to complications and is no longer recommended.
Formula	$\frac{\text{No. of patients with TBI treated with corticosteroids}}{\text{No. of patients with TBI discharged from the ICU}} \times 100$
Explanation of the terminology	Treated with corticosteroids: use of corticosteroids administered specifically for the management of TBI (not including corticosteroids administered for other purposes) TBI: including all degrees of severity
Population	All patients with TBI discharged from the ICU during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	0%
Commentaries	References: • Roberts I, Yates D, Sandercock P, Farrell B, Wasserberg J, Lomas G, Cottingham R, Svoboda P, Brayley N, Mazairac G, Laloe V, Munoz-Sanchez A, Arango M, Hartzenberg B, Khamis H, Yutthakasemsunt S, Komolafe E, Olldashi F, Yadav Y, Murillo-Cabezas F, Shakur H, Edwards P; CRASH trial collaborators. Effect of intravenous corticosteroids on death within 14 days in 10008 adults with clinically significant head injury (MRC CRASH trial): randomised placebo-controlled trial. Lancet. 2004 Oct 9-15; 364(9442):1321-8. • Alderson P, Roberts I. Corticosteroids for acute traumatic brain injury. Cochrane Database Syst Rev. 2005 Jan 25 ;(1):CD000196.

Indicator number 31

Name of the indicator	INCIDENCE OF ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS) IN SEVERE TRAUMA (ST)
Dimension	Effectiveness and risk
Justification	ARDS is a complication in patients with severe injuries that is associated to significant morbidity and mortality. Although related to different factors, early and appropriate resuscitation of patients with severe trauma can reduce the incidence of this complication.
Formula	$\frac{\text{No. of patients with ST and ARDS}}{\text{Total no. of patients with ST discharged from the ICU}} \times 100$
Explanation of the terminology	ARDS (1): respiratory failure of abrupt onset characterized by PaO2/FiO2 < 200 mmHg, the radiological presence of bilateral lung infiltrates with pulmonary capillary pressure (PCwP) < 18 mmHg, or clinical or radiologic signs of elevated left atrial pressure. Severe trauma: trauma causing severe injuries, expressed by a Revised Trauma Score (RTS) $\leq$ 11 at triage and/or an Injury Severity Score (ISS) $\geq$16
Population	All patients with ST discharged from the ICU during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	10%
Commentaries	References: • (1) Bernard GR, Artigas A, Brigham KL, Carlet J, Falke K, Hudson L, Lamy M, LeGall JR, Morris A, Spragg R. Report of the American-European consensus conference on ARDS: definitions, mechanisms, relevant outcomes and clinical trial coordination. The Consensus Committee. Intensive Care Med. 1994; 20(3):225-32. • Garcia M, Navarrete P, Rincón MD, Muñoz A, Jiménez JM, Cosano I. Analysis of clinico-epidemilogical factors and medical treatment of severe trauma in Andalucia (Spain). Pilot study. GITAN Proyect. [Article in Spanish]. Med Intensiva 2001; 25:327-332 • Champion HR, Sacco WJ, Copes WS, Gann DS, Gennarelli TA, Flanagan ME.A revision of the Trauma Score. J Trauma. 1989 May; 29(5):623-9. • Baker SP, O'Neill B, Haddon W Jr, Long WB.The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. J Trauma. 1974 Mar; 14(3):187-96. • Johnson KD, Cadambi A, Seibert GB.Incidence of adult respiratory distress syndrome in patients with multiple musculoskeletal injuries: effect of early operative stabilization of fractures. J Trauma. 1985 May; 25(5):375-84.

Indicator number 32 (fundamental indicator)

Name of the indicator	MONITORIZATION OF INTRACRANIAL PRESSURE (ICP) N SEVERE TRAUMATIC BRAIN INJURY WITH PATHOLOGIC CT FINDINGS
Dimension	Risk and effectiveness
Justification	Monitorization of intracranial pressure (ICP) allows the treatment of patients with severe traumatic brain injury (TBI) to be followed and managed. Elevated ICP is associated to worsened prognosis and monitoring it is useful for orienting specific treatment options using different therapeutic measures. Including the monitorization of ICP in TBI protocols has decreased mortality rates in this group of patients.
Formula	$\frac{\text{No. of patients with severe TBI and pathologic CT findings with ICP monitored}}{\text{No. of patients with severe TBI and pathologic CT findings}} \times 100$
Explanation of the terminology	• Severe HI: GCS < 9. • Pathologic CT findings: one or more of the following signs: hematomas, contusions, edema, or compression of the basal cisterns • ICP monitoring: by means of any of the standardized techniques
Population	All patients with severe TBI discharged from the ICU during the period reviewed. • Exclusion criterion: Patients with orders to withhold life support
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • Recommendations for the medical treatment of severe cranioencephalic trauma. Working group of Intensive Neurology of the Catalan Association of Intensive Health Care (Neuro-ACMI). [Article in Spanish].Med Clin (Barc). 2000 Apr 8;114(13):499-505 • Management and prognosis of severe traumatic brain injury. Guidelines for the management of severe traumatic brain injury. Brain Trauma Foundation 2000. J Neurotrauma 17:449-554. Available at: http://remi.uninet.edu/PAC/BTF.htm

Indicator number 33

Name of the indicator	MORTALITY IN SEVERE TRAUMATIC BRAIN INJURY
Dimension	Risk
Justification	Standardized treatment based on clinical practice guides has been shown to reduce mortality in severe TBI significantly. Mortality in severe TBI ranges from 39 to 51%, with brain death being the most common cause.
Formula	$\frac{\text{No. of in-hospital deaths among patients with severe TBI}}{\text{No. of patients with severe TBI discharged from the ICU}} \times 100$
Explanation of the terminology	Severe TBI: GCS < 9. In-hospital death: regardless of where it occurred
Population	Patients with severe TBI discharged from the ICU during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	50%
Commentaries	References: • Bulger EM, Nathens AB, Rivara FP, Moore M, MacKenzie EJ, Jurkovich GJ; Brain Trauma Foundation. Management of severe head injury: institutional variations in care and effect on outcome. Crit Care Med. 2002 Aug; 30(8):1870-6. • Reviejo K, Arcega I, Txoperena G, Azaldegui F, Alberdi F, Lara G. Analysis of prognostic factors of mortality in severe head injury. Proyecto Poliguitania. [Article in Spanish].Med Intensiva 2002; 26(5):241-247.

Indicator number 34

Name of the indicator	EARLY OSTEOSYNTHESIS IN FRACTURES OF THE FEMORAL DIAPHYSIS
Dimension	Risk, continuity of care, and effectiveness
Justification	Early stabilization of fractures of the femur in multiple trauma patients reduces mortality by decreasing the associated complications: sepsis, organ dysfunction, fat embolism, pulmonary thromboembolism, deterioration of the nutritional state, decubitus ulcers, etc. It also allows the patient to be moved earlier, reduces the needs for analgesics, facilitates nursing care, and reduces hospital stay.
Formula	$\frac{\text{No. of fractured femurs treated surgically within 24 hrs}}{\text{No. of fractured femurs with indications for surgery}} \times 100$
Explanation of the terminology	• Within 24 hrs: time period from the moment of fracture to surgery • Femoral fracture with indication for surgery: closed fracture of the femoral diaphysis • Exclusion criterion: patients in whom instability makes surgery contraindicated
Population	Patients with closed fractures of the femoral diaphysis discharged from the ICU during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • Muñoz Sánchez MA, Rincón Ferrari, Murillo Cabezas F, Jiménez P, Navarrete P. Jiménez Moragas JM, García Delgado M, García Alfaro CI Grupo GITAN. Severe trauma. Analysis of health care quality. [Article in Spanish]. Med Intensiva 2002; 26:7-12. • Bone LB, Johnson KD, Weigelt J, Scheinberg R. Early versus delayed stabilization of femoral fractures. A prospective randomized study. J Bone Joint Surg Am. 1989 Mar; 71(3):336-40. • Quality Assurance Audit Filters of the Committee on Trauma of the American College of Surgeons and of the Accreditation Manual of the Joint Commission on Accreditation of Healthcare Organizations.

Indicator number 35

Name of the indicator	EARLY SURGICAL FIXATION OF OPEN FRACTURES
Dimension	Risk
Justification	Early stabilization of OPEN fractures reduces mortality by reducing the associated complications, especially the risk of wound infection. It also allows the patient to be moved earlier, reduces the needs for analgesics, facilitates nursing care, and reduces hospital stay.
Formula	$\frac{\text{No. of open fractures treated surgically within 24 hrs}}{\text{No. of open fractures}} \times 100$
Explanation of the terminology	• Within 24 hrs: time period from the fracture to surgery • Surgical fixation includes external fixation • Open fracture: a lesion in which the fracture is in communication with the exterior through an opening through the skin and the rest of the tissues
Population	All patients with open fractures (femur, tibia, and upper limbs) discharged from the ICU during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • Muñoz Sánchez MA, Rincón Ferrari, Murillo Cabezas F, Jiménez P, Navarrete P. Jiménez Moragas JM, García Delgado M, García Alfaro CI Grupo GITAN. Severe trauma. Analysis of health care quality. [Article in Spanish]. Med Intensiva 2002; 26:7-12. • Border JR. Death from severe trauma: open fractures to multiple organ dysfunction syndrome. J Trauma. 1995 Jul; 39(1):12-22.

Indicator number 36

Name of the indicator	EARLY CEREBRAL ARTERIOGRAPHY IN SUBARACHNOID HEMORRHAGE (SAH)
Dimension	Effectiveness and risk
Justification	Current trends favor aneurysm exclusion in the first 72 hrs of SAH to reduce the rate of rebleeding (at its highest during the first days of SAH), thus avoiding severe complications. This is supported by level II evidence.
Formula	$\frac{\text{No. of patients with SAH with arteriography performed within 72 hrs}}{\text{No. of patients with SAH admitted to the ICU}} \times 100$
Explanation of the terminology	• Arteriography: performed for the diagnosis and definitive treatment (exclusion) of the cerebral aneurysm, regardless of the hospital to which the patient is admitted • Within 72 hrs: time period from the onset of SAH symptoms (rather than from admission) • SAH: spontaneous, not traumatic
Population	Patients with spontaneous SAH treated by the critical care department during the period reviewed, regardless of the severity of the SAH on admission.
Type	Process
Source of data	Clinical records
Standard	90%
Commentaries	References: • Findlay JM.Current management of aneurysmal subarachnoid hemorrhage guidelines from the Canadian Neurosurgical Society. Can J Neurol Sci. 1997 May; 24(2):161-70. • Vermeulen M. Subarachnoid haemorrhage: diagnosis and treatment. J Neurol. 1996 Jul; 243(7):496-501. • Kassell NF, Torner JC. Aneurysmal rebleeding: a preliminary report from the Cooperative Aneurysm Study. Neurosurgery. 1983 Nov; 13(5):479-81. • Munoz-Sanchez MA, Garcia-Alfaro C, Munoz-Lopez A, Guerrero-Lopez F, Jimenez-Moragas JM, Murillo-Cabezas F, Martinez-Escobar S, Navarrete-Navarro P, de la Torre-Prados MV, Dayuela-Dominguez A; Grupo EHSA. The EHSA project: the study of spontaneous subarachnoid haemorrhages in Andalusia. Incidence and results. [Article in Spanish]. Rev Neurol. 2003 Feb 15-28; 36(4):301-6.

Indicator number 37

Name of the indicator	ADMINISTRATION OF NIMODIPINE IN SUBARACHNOID HEMORRHAGE
Dimension	Effectiveness and risk
Justification	The early administration of nimodipine has proven efficacious (level of evidence I) in reducing ischemic neurologic sequelae in patients with subarachnoid hemorrhage (SAH). The mechanism appears to be more related to a direct cellular mechanism than to reduced cerebral spasm.
Formula	No. of patients with SAH treated with nimodipine ---------- x100 No. of patients with SAH admitted to the ICU
Explanation of the terminology	• SAH: spontaneous, not traumatic • Treatment with nimodipine: oral or intravenous
Population	All patients with spontaneous SAH treated by the critical care department during the period reviewed, regardless of the severity of the SAH on admission.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: (Level I evidence) • Barker FG 2nd, Ogilvy CS. Efficacy of prophylactic nimodipine for delayed ischemic deficit after subarachnoid hemorrhage: a metaanalysis. J Neurosurg. 1996 Mar; 84(3):405-14. • Feigin VL, Rinkel GJ, Algra A, Vermeulen M, van Gijn J.Calcium antagonists in patients with aneurysmal subarachnoid hemorrhage: a systematic review. Neurology. 1998 Apr; 50(4):876-83. • Rinkel GJ, Feigin VL, Algra A, van den Bergh WM, Vermeulen M, van Gijn J.Calcium antagonists for aneurysmal subarachnoid haemorrhage. Cochrane Database Syst Rev. 2005 Jan 25;(1):CD000277Rinkel GJ, Feigin VL, Algra A, Vermeulen M, van Gijn J. Calcium antagonists for aneurysmal subarachnoid haemorrhage. Cochrane Database Syst Rev 2002 ;(4):CD000277.

Indicator number 38

Name of the indicator	POLYNEUROPATHY IN CRITICAL PATIENTS
Dimension	Risk
Justification	Polyneuropathy in critical patients is especially common in septic patients with organ dysfunction undergoing sedation and treatment with muscle relaxants. It is associated to increased mortality as well as lengthened mechanical ventilation (MV) and significant long-term sequelae.
Formula	No. of patients with MV > 72 hrs and polyneuropathy ---------- x100 No. of patients with MV > 72 hrs
Explanation of the terminology	Polyneuropathy: Clinical signs and symptoms meeting neurophysiologic diagnostic criteria for polyneuropathy
Population	All patients with MV > 72 hrs during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	< 50%
Commentaries	References: • Van Mook WN, Hulsewe-Evers RP.Critical illness polyneuropathy. Curr Opin Crit Care. 2002 Aug; 8(4):302-10. • Granacho Montero J, Amaya Villar R. Polineuropatía y miopatía del paciente crítico: ¿en qué hemos avanzado? Med Intensiva 2004; 28:65-9. • Garnacho-Montero J, Madrazo-Osuna J, Garcia-Garmendia JL, Ortiz-Leyba C, Jimenez-Jimenez FJ, Barrero-Almodovar A, Garnacho-Montero MC, Moyano-Del-Estad MR. Critical illness polyneuropathy: risk factors and clinical consequences. A cohort study in septic patients. Intensive Care Med. 2001 Aug; 27(8):1288-96.

Indicator number 39

Name of the indicator	IMMEDIATE CT EXAMINATION IN ISCHEMIC STROKE
Dimension	Effectiveness and appropriateness
Justification	Intravenous thrombolysis within 3 hrs of ischemic stroke has proven efficacious, reducing neurologic deficit and improving the quality of life. CT images should be immediately available in cases of suspected ischemic stroke in patients susceptible to cerebral thrombolysis.
Formula	$\frac{\text{No. of patients with ischemic stroke susceptible to fibrinolysis undergoing CT within 2 hrs}}{\text{Total no. of patients with ischemic stroke susceptible to fibrinolysis undergoing CT}} \times 100$
Explanation of the terminology	• Within 2 hrs: time period from the onset of symptoms of stroke (rather than from admission) • Susceptible to fibrinolysis: according to standardized criteria (1).
Population	All patients with ischemic stroke treated by the critical care department during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	90%
Commentaries	References: • (1) Tissue plasminogen activator for acute ischemic stroke. The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. N Engl J Med. 1995 Dec 14; 333(24):1581-7. • Ringleb PA, Schellinger PD, Schranz C, Hacke W. Thrombolytic therapy within 3 to 6 hours after onset of ischemic stroke: useful or harmful? Stroke. 2002 May; 33(5):1437-41.. • Alvarez Sabin J, Molina C, Abilleira S, Montaner J, Garcia F, Alijotas J. "Stroke code". Shortening the delay in reperfusion treatment of acute ischemic stroke. [Article in Spanish]. Med Clin (Barc). 1999 Oct 23; 113(13):481-3.

Indicator number 40

Name of the indicator	INTRAVENOUS FIBRINOLYSIS IN ACUTE ISCHEMIC STROKE
Dimension	Effectiveness
Justification	Intravenous fibrinolysis performed within 3 hrs of onset of symptoms is efficacious in reducing sequelae in these patients, leading to better quality of life.
Formula	No. of patients with ischemic stroke receiving IV fibrinolysis ---------- x100 Total no. of patients with ischemic stroke
Explanation of the terminology	Fibrinolysis: Administration of fibrinolytics according to standardized criteria (1,2)
Population	All patients with acute ischemic stroke treated by the critical care department during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: (Level I evidence) • (1) Tissue plasminogen activator for acute ischemic stroke. The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. N Engl J Med. 1995 Dec 14; 333(24):1581-7. • (2) Wardlaw JM, Zoppo G, Yamaguchi T, Berge E.Thrombolysis for acute ischaemic stroke. Cochrane Database Syst Rev. 2003 ;(3):CD000213. • Hacke W, Donnan G, Fieschi C, Kaste M, von Kummer R, Broderick JP, Brott T, Frankel M, Grotta JC, Haley EC Jr, Kwiatkowski T, Levine SR, Lewandowski C, Lu M, Lyden P, Marler JR, Patel S, Tilley BC, Albers G, Bluhmki E, Wilhelm M, Hamilton S; ATLANTIS Trials Investigators; ECASS Trials Investigators; NINDS rt-PA Study Group Investigators. Association of outcome with early stroke treatment: pooled analysis of ATLANTIS, ECASS, and NINDS rt-PA stroke trials. Lancet. 2004 Mar 6; 363(9411):768-74. • European Stroke Initiative recommendations for stroke management. European Stroke Council, European Neurological Society and European Federation of Neurological Societies. Cerebrovasc Dis. 2000 Sep-Oct; 10(5):335-51.

Indicator number 41

Name of the indicator	USE OF SOMATOSENSORY EVOKED POTENTIALS (SEP) IN POST-ANOXIC ENCEPHALOPATHY
Dimension	Appropriateness
Justification	Patients with post-anoxic encephalopathy cause family suffering and a significant burden of care and consumption of human and material resources. Performing SEP helps estimate the long-term prognosis from the third day (specificity 100%). The bilateral absence of the N20 component of the SEP in patients with absent photomotor reflexes and no response to pain orients the treatment of these patients, including the decision to withhold or withdraw life support.
Formula	$\frac{\text{No. of patients with post-anoxic encephalopathy undergoing SEP}}{\text{No. of patients with post-anoxic encephalopathy*}} \times 100$
Explanation of the terminology	SEP: Should ideally be performed after the third day
Population	All patients with post-anoxic encephalopathy during the period reviewed. • Inclusion criteria: All patients with > 3 days post-anoxic encephalopathy with absent photomotor reflex and no response to pain • Exclusion criteria: Brain death
Type	Process
Source of data	Clinical records
Standard	90%
Commentaries	References: • De la Cal MA, Latour J, de los Reyes M, Palencia E. Recomendaciones de la 6ª Conferencia de Consenso de la SEMICYUC. Estado vegetativo persistente postanoxia en el adulto. Med Intensiva 2003; 27(8):544-55. • Rothstein TL.The role of evoked potentials in anoxic-ischemic coma and severe brain trauma.J Clin Neurophysiol. 2000 Sep;17(5):486-97

Indicator number 42

Name of the indicator	BACTEREMIA RELATED TO CENTRAL VENOUS CATHETER
Dimension	Risk and effectiveness
Justification	The use of central venous catheters (CVC) is indispensable in the treatment of hospitalized patients. Infection is one of the most important complications of CVC use. Bacteremia due to CVC is the main cause of nosocomial bacteremia in ICUs, being the third cause of nosocomial infection (after pneumonia and urinary infections). Although its real impact has not been well established, mortality is estimated at 10% and increases in ICU stays at 5-8 days. Like all nosocomial infections, bacteremia due to CVC can be prevented.
Formula	$\frac{\text{No. of episodes of bacteremia due to CVC}}{\text{Total no. of days CVC}}$ x1000 days CVC
Explanation of the terminology	Bacteremia due to CVC: meeting the criteria approved at the SEIMC-SEMICYUC Consensus Conference on infections related to intravascular catheters.
Population	All days of CVC in patients discharged after having spent > 24 hrs in the ICU during the period reviewed. • Exclusion criterion: peripherally inserted CVC
Type	Outcome
Source of data	Clinical records or ENVIN (National Study to Invigilate Nosocomial Infection)
Standard	Four episodes per 1,000 days CVC
Commentaries	Source of standards: results of the ENVIN-ICU Study. 2002 report References: • Álvarez F, Palomar M, Olaechea P, Insausti J, Bermejo B, Cerdá E y grupo de estudio de Vigilancia de infección nosocomial en UCI. National study of nosocomial infection surveillance in intensive care units. Report of the year 2002. [Article in Spanish]. Med Intensiva 2005; 29:1-12. • Ariza J, Leon C, Rodríguez Noriega A, Fernández Mondejar E. Conferencia de Consenso SEIMC-SEMICYUC. Conclusiones de la conferencia de consenso en infecciones por catéter. Med Intensiva 2003; 27:615-620.

Indicator number 43

Name of the indicator	URINARY TRACT INFECTION (UTI) RELATED TO URETHRAL CATHETER
Dimension	Risk and effectiveness
Justification	UTI related to urethral catheterization is one of the most common nosocomial infections in critical care (usually the second most common, after pneumonia associated to mechanical ventilation). Although its impact on mortality is low, UTI has a significant impact on morbidity, length of stay, and cost of care. Like all nosocomial infections, UTI can be prevented.
Formula	$\frac{\text{No. of episodes of UTI}}{\text{Total no. of days of urethral catheter use}}$ x1000 days of urethral catheter use
Explanation of the terminology	UTI: meeting the criteria published by the Center for Disease Control (CDC) and used in the ENVIN-ICU Study.
Population	All days of urethral catheter use in patients discharged after having spent > 24 hrs in the ICU during the period reviewed.
Type	Outcome
Source of data	Clinical records or ENVIN (National Study to Invigilate Nosocomial Infection) program
Standard	Six episodes per 1,000 days of urethral catheter use
Commentaries	Source of standards: results of the ENVIN-ICU Study. 2002 report References: • Álvarez F, Palomar M, Olaechea P, Insausti J, Bermejo B, Cerdá E y grupo de estudio de Vigilancia de infección nosocomial en UCI. National study of nosocomial infection surveillance in intensive care units. Report of the year 2002. [Article in Spanish]. Med Intensiva 2005; 29:1-12. • Garner JS, Jarvis WR, Emori TG, Horan TC, Hughes JM.CDC definitions for nosocomial infections, 1988. Am J Infect Control. 1988 Jun; 16(3):128-40.

Indicator number 44 (fundamental indicator)

Name of the indicator	PNEUMONIA ASSOCIATED TO MECHANICAL VENTILATION (PAMV)
Dimension	Risk and effectiveness
Justification	PAMV is normally the most common nosocomial infection in the ICU. The importance of monitoring this indicator derives both from its impact on mortality (approximately one third of patients developing PAMV die as a result of the infection) and on morbidity, with an average increase of ICU stay of 4 days and increased costs. Like all nosocomial infections, PAMV can be prevented.
Formula	$\frac{\text{No. of episodes of PAMV}}{\text{Total no. of days of invasive mechanical ventilation}}$ x1000 days of MV
Explanation of the terminology	Pneumonia associated to mechanical ventilation: meeting the criteria published by the Centers for Disease Control (CDC) and used in the ENVIN-ICU Study and for the GTEI-SEMICYUC Consensus Document.
Population	All days of mechanical ventilation in patients discharged after having spent > 24 hrs in the ICU during the period reviewed.
Type	Outcome
Source of data	Clinical records or ENVIN (National Study to Invigilate Nosocomial Infection) program
Standard	18 episodes per 1,000 days of MV
Commentaries	Source of standards: results of the ENVIN-ICU Study. 2002 report References: • Garner JS, Jarvis WR, Emori TG, Horan TC, Hughes JM.CDC definitions for nosocomial infections, 1988. Am J Infect Control. 1988 Jun; 16(3):128-40. • Álvarez F, Palomar M, Olaechea P, Insausti J, Bermejo B, Cerdá E y grupo de estudio de Vigilancia de infección nosocomial en UCI. National study of nosocomial infection surveillance in intensive care units. Report of the year 2002. [Article in Spanish]. Med Intensiva 2005; 29:1-12. • Álvarez Lerma F, Torres Martí A, Rodríguez de Castro F y Comisión de expertos del GTEI-SEMICYUC, Área de Tuberculosis e Infección Respiratoria de la SEPAR y el Grupo de Estudio de la Infección Hospitalaria de la SEIMC (GEIH-SEIMC). Recommendations for the diagnosis of ventilator-associated pneumonia. [Article in Spanish]. Med Intensiva 2001; 25(7):271-282.

Indicator number 45 (fundamental indicator)

Name of the indicator	EARLY MANAGEMENT OF SEVERE SEPSIS / SEPTIC SHOCK
Dimension	Effectiveness
Justification	Severe sepsis (SeS) / septic shock (SS) is common in critical care departments and has high morbidity, mortality, and use of resources. Different therapeutic measures have proven effective in decreasing mortality among patients in the first hours of SeS / SS.
Formula	No. of patients with SeS / SS administered the therapeutic measures ---------- x 100 No. of patients with SeS /SS
Explanation of the terminology	• Definitions according to standardized criteria (1) • The therapeutic measures are: 1. Initial resuscitation • Central venous pressure (CVP): 8-12 mmHg or 12-15 mmHg if mechanically ventilated • Mean arterial pressure (MAP): > 65 mmHg • Diuresis: >0.5 ml/Kg/h • Central venous saturation (CVS) or mixed > 70% 2. Early administration of antibiotics (see indicator) 3. Assessment of activated protein C administration • 18 years • Multiple organ failure (2 or more organs) or APACHE ≥ 25 • < 48 hrs • No orders to withhold life support 4. Evaluation of the administration of corticosteroids (see indicator) * 5. Strict control of glycemia (see indicator) * Only in cases of septic shock
Population	All patients with SeS / SS discharged from the ICU during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • (1) Levy MM, Fink MP, Marshall JC, Abraham E, Angus D, Cook D, Cohen J, Opal SM, Vincent JL, Ramsay G; International Sepsis Definitions Conference. 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference. Intensive Care Med. 2003 Apr;29(4):530-8 • Dellinger RP, Carlet JM, Masur H, Gerlach H, Calandra T, Cohen J, Gea-Banacloche J, Keh D, Marshall JC, Parker MM, Ramsay G, Zimmerman JL, Vincent JL, Levy MM. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. Intensive Care Med. 2004 Apr; 30(4):536-55. • Bernard GR, Vincent JL, Laterre PF, LaRosa SP, Dhainaut JF, Lopez-Rodriguez A, Steingrub JS, Garber GE, Helterbrand JD, Ely EW, Fisher CJ Jr; Recombinant human protein C Worldwide Evaluation in Severe Sepsis (PROWESS) study group. Efficacy and safety of recombinant human activated protein C for severe sepsis. N Engl J Med. 2001 Mar 8; 344(10):699-709. • Rivers E, Nguyen B, Havstad S, Ressler J, Muzzin A, Knoblich B, Peterson E, Tomlanovich M; Early Goal-Directed Therapy Collaborative Group. Early goal-directed therapy in the treatment of severe sepsis and septic shock. N Engl J Med. 2001 Nov 8; 345(19):1368-77. • Annane D, Sebille V, Charpentier C, Bollaert PE, Francois B, Korach JM, Capellier G, Cohen Y, Azoulay E, Troche G, Chaumet-Riffaut P, Bellissant E.Effect of treatment with low doses of hydrocortisone and fludrocortisone on mortality in patients with septic shock.JAMA. 2002 Aug 21; 288(7):862-71. • van den Berghe G, Wouters P, Weekers F, Verwaest C, Bruyninckx F, Schetz M, Vlasselaers D, Ferdinande P, Lauwers P, Bouillon R. Intensive insulin therapy in the critically ill patients.N Engl J Med. 2001 Nov 8;345(19):1359-67.

Indicator number 46

Name of the indicator	INAPPROPRIATE EMPIRICAL ANTIBIOTIC TREATMENT FOR INFECTIONS TREATED IN THE ICU
Dimension	Risk and effectiveness
Justification	The administration of inappropriate empirical antibiotic treatment in infections is associated to increased mortality.
Formula	No. of patients with infection receiving inappropriate empirical antibiotic treatment ---------- x 100 No. of patients with infection
Explanation of the terminology	• Empirical treatment: administration of antibiotics within 24 hrs of onset of infection when the microorganism responsible is unknown • Inappropriate empirical antibiotic treatment: 1. When the antibiogram after initial treatment shows that: • none of the antibiotics administered acts against the microorganism identified, according to accepted standards. • the microorganism identified is resistant to the antibiotics administered. • When ***Pseudomonas aeruginosa*** is identified and < 2 antibiotics have been administered. 2. Antibiotics have not been administered in the correct dosage or route. 3. The antibiotics administered do not penetrate the focus of infection well. When combinations of antibiotics are administered, at least one of them must meet the above-mentioned criteria.
Population	All patients with infection discharged from the ICU during the period reviewed. • Exclusion criteria: infections in which no microorganism has been identified.
Type	Outcome
Source of data	Clinical records
Standard	10%
Commentaries	References: • Garnacho-Montero J, Garcia-Garmendia JL, Barrero-Almodovar A, Jimenez-Jimenez FJ, Perez-Paredes C, Ortiz-Leyba C. Impact of adequate empirical antibiotic therapy on the outcome of patients admitted to the intensive care unit with sepsis. Crit Care Med. 2003 Dec; 31(12):2742-51. • Dellinger RP, Carlet JM, Masur H, Gerlach H, Calandra T, Cohen J, Gea-Banacloche J, Keh D, Marshall JC, Parker MM, Ramsay G, Zimmerman JL, Vincent JL, Levy MM. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. Intensive Care Med. 2004 Apr; 30(4):536-55. • Valles J, Rello J, Ochagavia A, Garnacho J, Alcala MA. Community-acquired bloodstream infection in critically ill adult patients: impact of shock and inappropriate antibiotic therapy on survival.Chest. 2003 May; 123(5):1615-24. • MacArthur RD, Miller M, Albertson T, Panacek E, Johnson D, Teoh L, Barchuk W. Adequacy of early empiric antibiotic treatment and survival in severe sepsis: experience from the MONARCS trial.Clin Infect Dis. 2004 Jan 15;38(2):284-8. • Leone M, Bourgoin A, Cambon S, Dubuc M, Albanese J, Martin C. Empirical antimicrobial therapy of septic shock patients: adequacy and impact on the outcome. Crit Care Med. 2003 Feb; 31(2):462-7.

Indicator number 47

Name of the indicator	METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* INFECTIONS
Dimension	Risk and effectiveness
Justification	The development of resistant strains of bacteria is a growing problem. This is especially important in the ICU owing to the difficulties involved in adequate control of the infection (critically ill patients, multiple invasive maneuvers, lack of asepsis, admission of carriers) and the frequency of antibiotic use. The appearance of multi-resistant microorganisms, particularly methicillin-resistant ***Staphylococcus aureus*** (MRSA), is associated with increased morbidity and mortality. Applying an appropriate antibiotic policy and a system for monitoring infection can help to reduce the magnitude of the problem.
Formula	$\frac{\text{No. of episodes of MRSA infection}}{\text{Total no. of days stay}} \times 1000 \text{ days}$
Explanation of the terminology	• MRSA infection: Criteria published by the Centers for Disease Control (CDC) and used in the ENVI-ICU Study. Only MRSA isolated from infection acquired in the ICU (onset 48 hours after admission to ICU) will be evaluated • Resistance to methicillin / oxacillin: ***S.aureus*** with MIC > 2 µg/ml
Population	All patients having spent > 24 hrs in the ICU discharged during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	0.04%
Commentaries	References: • Garner JS, Jarvis WR, Emori TG, Horan TC, Hughes JM.CDC definitions for nosocomial infections, 1988. Am J Infect Control. 1988 Jun; 16(3):128-40. • Thompson DS. Methicillin-resistant Staphylococcus aureus in a general intensive care unit. J R Soc Med. 2004 Nov; 97(11):521-6. • Daxboeck F, Assadian O, Apfalter P, Koller W.Resistance rates of Staphylococcus aureus in relation to patient status and type of specimen. J Antimicrob Chemother. 2004 Jul; 54(1):163-7. • Theaker C, Ormond-Walshe S, Azadian B, Soni N. MRSA in the critically ill. J Hosp Infect. 2001 Jun;48(2):98-102 Theaker C, Ormond-Walshe S, Azadian B, Soni N. MRSA in the critically ill. J Hosp Infect. 2001 Jun; 48(2):98-102. • Pronovost PJ, Berenholtz SM, Ngo K, McDowell M, Holzmueller C, Haraden C, Resar R, Rainey T, Nolan T, Dorman T. Developing and pilot testing quality indicators in the intensive care unit.J Crit Care. 2003 Sep; 18(3):145-55.

Indicator number 48

Name of the indicator	INDICATIONS FOR ISOLATION
Dimension	Risk and appropriateness
Justification	Preventing cross-transmission of infections / colonization by microorganisms of epidemiologic risk.
Formula	No. of patients with indications for isolation isolated ---------- x 100 No. of patients with indications for isolation
Explanation of the terminology	• Isolation: Application of contact isolation measures • Indications for isolation: 1. Preventive isolation: • Patients transferred from ICUs at other centers. • Patients transferred from hospital wards at other centers with risk factors (prolonged hospitalization, decubitus ulcers, infected surgical wounds, ...). • Patients coming from nursing homes. • Patients with a history of positive cultures for microorganisms with epidemiologic risk (***M. tuberculosis***, Meningococcus, MRSA, wide-spectrum betalactamase producing Gram-negative bacilli, Pseudomonas / multiresistant Acinetobacter, vancomycin-resistant enterococci....). 2. Documented isolation: • Patients with positive culture for microorganisms representing an epidemiologic risk
Population	All patients with indications for isolation discharged from the ICU during the period reviewed.
Type	Process
Source of data	Clinical records, Microbiology department
Standard	100%
Commentaries	References: • Garner JS.Guideline for isolation precautions in hospitals. The Hospital Infection Control Practices Advisory Committee. Infect Control Hosp Epidemiol. 1996 Jan; 17(1):53-80. • Alvarez-Lerma F, Gasulla Guillermo M, Abad Peruga V, Pueyo Pont MJ, Tarrago Eixarch E. Effectiveness of contact isolation in the control of multiresistant bacteria in an intensive care service. [Article in Spanish]. Enferm Infecc Microbiol Clin. 2002 Feb;20(2):57-63 • Cooper BS, Stone SP, Kibbler CC, Cookson BD, Roberts JA, Medley GF, Duckworth G, Lai R, Ebrahim S. Isolation measures in the hospital management of methicillin resistant Staphylococcus aureus (MRSA): systematic review of the literature. BMJ. 2004 Sep 4; 329(7465):533.

Indicator number 49

Name of the indicator	ADMINISTRATION OF CORTICOSTEROIDS IN SEPTIC SHOCK
Dimension	Effectiveness and risk
Justification	The administration of low doses of hydrocortisone has proven to reduce mortality in patients with septic shock (SS). Grade C recommendation.
Formula	No. of patients with SS administered corticosteroids ---------- x 100 days No. of patients with SS discharged from critical care
Explanation of the terminology	• Administration of corticosteroids: 200-300 mg/day for 7 days (3-4 doses/day or continuous administration) • Septic shock: according to standardized criteria (1) The use of a test to assess adrenal function (adrenal stimulation test) is recommendable.
Population	All patients with SS discharged from the ICU during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	95 %
Commentaries	References: • (1) Levy MM, Fink MP, Marshall JC, Abraham E, Angus D, Cook D, Cohen J, Opal SM, Vincent JL, Ramsay G; International Sepsis Definitions Conference. 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference. Intensive Care Med. 2003 Apr; 29(4):530-8. • Keh D, Sprung CL. Use of corticosteroid therapy in patients with sepsis and septic shock: an evidence-based review. Crit Care Med. 2004 Nov; 32(11 Suppl):S527-33. • Annane D, Sebille V, Charpentier C, Bollaert PE, Francois B, Korach JM, Capellier G, Cohen Y, Azoulay E, Troche G, Chaumet-Riffaut P, Bellissant E. Effect of treatment with low doses of hydrocortisone and fludrocortisone on mortality in patients with septic shock. JAMA. 2002 Aug 21; 288(7):862-71.

Indicator number 50

Name of the indicator	EARLY INITIATION OF ANTIBIOTIC THERAPY IN SEVERE SEPSIS
Dimension	Effectiveness and risk
Justification	Early administration of antibiotics improves the prognosis in severe sepsis. Clinical practice guides recommend the administration of antibiotics within 1 hr of diagnosing sepsis. (Grade E recommendation).
Formula	No. of patients with severe sepsis administered antibiotics early ---------- x 100 No. of patients with severe sepsis
Explanation of the terminology	• Severe sepsis: defined according to standardized criteria (1) • Early administration: administration of antibiotics within 1 hr from the time of diagnosis of severe sepsis, regardless of where the diagnosis was reached: ICU, emergency department, or hospital ward.
Population	All patients with severe sepsis discharged from the ICU during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	Prior to the administration of antibiotics, blood cultures and samples must be obtained in function of the suspected septic focus. References: • (1) Levy MM, Fink MP, Marshall JC, Abraham E, Angus D, Cook D, Cohen J, Opal SM, Vincent JL, Ramsay G; International Sepsis Definitions Conference. 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference. Intensive Care Med. 2003 Apr; 29(4):530-8. • Bochud PY, Bonten M, Marchetti O, Calandra T. Antimicrobial therapy for patients with severe sepsis and septic shock: an evidence-based review. Crit Care Med. 2004 Nov; 32(11 Suppl):S495-512. • Fish DN. Optimal antimicrobial therapy for sepsis. Am J Health Syst Pharm. 2002 Feb 15;59 Suppl 1:S13-9 • Bochud PY, Glauser MP, Calandra T; International Sepsis Forum.Antibiotics in sepsis. Intensive Care Med. 2001; 27 Suppl 1:S33-48.

Indicator number 51

Name of the indicator	COMPLICATIONS OF TOTAL PARENTERAL NUTRITION (TPN): HYPERGLYCEMIA LIVER DYSFUNCTION
Dimension	Risk
Justification	TPN has been associated to different complications in critical patients, most commonly hyperglycemia and liver dysfunction. In cases of liver dysfunction, other factors, such as sepsis, may be involved. These complications must be managed and treating them can reduce morbidity and the length of hospital stay.
Formula	$\frac{\text{No. of complications (hyperglycemia / liver dysfunction) in patients with TPN}}{\text{Total no. of days TPN}} \times 100$
Explanation of the terminology	Complications: appearance of • Hyperglycemia: Plasma glycemia values > 120mg/dl in any of the determinations, or • Liver dysfunction: alterations in GOT, GPT, gGT, AP, bilirubin, and INR that are clinically significant and necessitate reduces or eliminating TPN.
Population	All ICU patients receiving TPN during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	Hypergycemia: 25% Liver dysfunction: < 10%
Commentaries	References: • Quigley EM, Marsh MN, Shaffer JL, Markin RS. Hepatobiliary complications of total parenteral nutrition.Gastroenterology. 1993 Jan; 104(1):286-301. • Heyland DK, Dhaliwal R, Drover JW, Gramlich L, Dodek P; Canadian Critical Care Clinical Practice Guidelines Committee.Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. JPEN J Parenter Enteral Nutr. 2003 Sep-Oct; 27(5):355-73. • Rosmarin DK, Wardlaw GM, Mirtallo J. Hyperglycemia associated with high, continuous infusion rates of total parenteral nutrition dextrose. Nutr Clin Pract. 1996 Aug; 11(4):151-6.

Indicator number 52

Name of the indicator	MAINTAINING APPROPRIATE LEVELS OF GLYCEMIA
Dimension	Effectiveness
Justification	Several studies suggest that aggressive control of glycemia benefits critical patients. Strict control of glycemia using insulin infusion to maintain glucose levels between 80 and 110 mg/dl have proven to reduce morbidity and mortality significantly in critical patients under mechanical ventilation remaining more than 5 days in the ICU and in patients after heart surgery, with a greater reduction in mortality among patients with multiple organ dysfunction associated to sepsis.
Formula	No. of patients with indications for strict control of glycemia presenting at least 1 episode of hyperglycemia ---------- x 100 No. of patients with indications for strict control of glycemia
Explanation of the terminology	Hyperglycemia: glycemia values > 150mg/dl Patients with indications for strict control of glycemia: • Mechanical ventilation > 48 hrs • Postoperative heart surgery • Severe sepsis / septic shock • Organ dysfunction syndrome
Population	All patients requiring strict control of glycemia during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	80%
Commentaries	References: • van den Berghe G, Wouters P, Weekers F, Verwaest C, Bruyninckx F, Schetz M, Vlasselaers D, Ferdinande P, Lauwers P, Bouillon R.Intensive insulin therapy in the critically ill patients. N Engl J Med. 2001 Nov 8; 345(19):1359-67. • Finney SJ, Zekveld C, Elia A, Evans TW.Glucose control and mortality in critically ill patients. JAMA. 2003 Oct 15; 290(15):2041-7. • Scott JF, Robinson GM, French JM, O'Connell JE, Alberti KG, Gray CS. Glucose potassium insulin infusions in the treatment of acute stroke patients with mild to moderate hyperglycemia: the Glucose Insulin in Stroke Trial (GIST). Stroke. 1999 Apr; 30(4):793-9. • Van den Berghe G, Wouters PJ, Bouillon R, Weekers F, Verwaest C, Schetz M, Vlasselaers D, Ferdinande P, Lauwers P. Outcome benefit of intensive insulin therapy in the critically ill: Insulin dose versus glycemic control. Crit Care Med. 2003 Feb; 31(2):359-66.

Indicator number 53

Name of the indicator	SEVERE HYPOGLYCEMIA
Dimension	Risk
Justification	There is no universal device that can infuse IV insulin effectively without compromising patients'safety. Therefore, it is necessary to measure the percentage of severe hypoglycemias to establish adequate measures to help to limit them as far as possible. Standardization of protocols for perfusion of insulin, disseminated so that all personnel are familiar with them, improves the efficiency and safety of glucose control in critical patients.
Formula	Total no. of glucose determinations with values <50mg/ dl ---------- x 100 Total no. of glucose determinations
Explanation of the terminology	All determinations carried out in patients with indications for strict control of glycemia should be quantified. Indications for strict control of glycemia: • Invasive mechanical ventilation > 48 hrs • Postoperative heart surgery • Multiple organ dysfunction syndrome with or without sepsis • Severe sepsis / septic shock
Population	All glucose determinations in patients requiring strict control of glycemia during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	0.5%
Commentaries	References: • Kanji S, Singh A, Tierney M, Meggison H, McIntyre L, Hebert PC. Standardization of intravenous insulin therapy improves the efficiency and safety of blood glucose control in critically ill adults. Intensive Care Med. 2004 May; 30(5):804-10. • van den Berghe G, Wouters P, Weekers F, Verwaest C, Bruyninckx F, Schetz M, Vlasselaers D, Ferdinande P, Lauwers P, Bouillon R.Intensive insulin therapy in the critically ill patients. N Engl J Med. 2001 Nov 8; 345(19):1359-67. • Goldberg PA, Siegel MD, Sherwin RS, Halickman JI, Lee M, Bailey VA, Lee SL, Dziura JD, Inzucchi SE.Implementation of a safe and effective insulin infusion protocol in a medical intensive care unit. Diabetes Care. 2004 Feb; 27(2):461-7. • Krinsley JS. Effect of an intensive glucose management protocol on the mortality of critically ill adult patients. Mayo Clin Proc. 2004 Aug; 79(8):992-1000.

Indicator number 54

Name of the indicator	IDENTIFICATION OF NUTRITIONAL RISK
Dimension	Effectiveness and risk
Justification	The evaluation of nutritional risk (NR) is the first step in the treatment of malnutrition-related diseases. It enables the population requiring a complete nutritional evaluation to be identified and complementary nutritional treatment to be employed. The evaluation of a patient's NR should be done routinely on admission and repeated, depending on the degree of risk, periodically during the hospital stay.
Formula	$\frac{\text{No. of patients with an initial evaluation of NR}}{\text{No. of patients discharged from the critical care department}} \times 100$
Explanation of the terminology	Evaluation of NR: can be done using specific indices designed for this purpose (e.g., SGA or CONUT scales). If specific scales are not used, the following factors constituting NR should be evaluated: • Presence of cachexia • Weight loss > 10% body weight over the last 3 months • Albumin < 30 g/l • Artificial nutrition • Inadequate ingestion maintained for 1 week Initial evaluation: performed within 48 hrs of admission (depending on NR, periodic reevaluation is recommendable).
Population	All patients admitted to the ICU during the period reviewed. Exclusion criterion: < 48 hrs ICU stay
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • SGA: Subjective Global Assessment. Planas M, Bonet A, Farré M. Valoración nutricional. Influencia de la malnutrición sobre las funciones fisiológicas. En Monografías de Medicina Crítica Práctica SEMICYUC. García de Lorenzo A. Soporte Nutricional en el paciente grave. EdikaMed 2002. • Ignacio de Ulibarri J, Gonzalez-Madrono A, de Villar NG, Gonzalez P, Gonzalez B, Mancha A, Rodriguez F, Fernandez G. CONUT: a tool for controlling nutritional status. First validation in a hospital population. Nutr Hosp. 2005 Jan-Feb; 20(1):38-45. • Heyland DK, Dhaliwal R, Drover JW, Gramlich L, Dodek P; Canadian Critical Care Clinical Practice Guidelines Committee.Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. JPEN J Parenter Enteral Nutr. 2003 Sep-Oct; 27(5):355-73. • Arrowsmith H.A critical evaluation of the use of nutrition screening tools by nurses. Br J Nurs. 1999 Dec 9-2000 Jan 12; 8(22):1483-90.

Indicator number 55

Name of the indicator	ASSESSMENT OF NUTRITIONAL STATUS
Dimension	Effectiveness
Justification	The evaluation of nutritional status (NS) is the first step in nutritional treatment. It enables us to determine whether or not a patient is affected by malnutrition, classify and quantify the type and degree of malnutrition, reach a metabolic-nutritional diagnosis, choose the manner of administration, monitor the results of nutrition, and evaluate the efficacy of a determinate nutritional therapy.
Formula	No. of patients with NR and assessment of NS ---------- x 100 No. of patients admitted with NR
Explanation of the terminology	Patients with NR: identified using specific indices designed for this purpose (e.g., SGA or CONUT scales), or if specific scales are not used, evaluating the following factors constituting NR: • Presence of cachexia • Weight loss > 10% body weight over the last 3 months • Albumin < 30 g/l • Artificial nutrition • Inadequate ingestion maintained for 1 week Assessment of nutritional status includes: • Anamnesis and examination • Anthropometric parameters: weight, height • Biochemical parameters related to metabolism of proteins, sugars, and fats, and to the status of certain vitamins and minerals. • Immunologic markers (leukocytes and leukocyte differential)
Population	All patients admitted to the ICU with NR during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Heyland DK, Dhaliwal R, Drover JW, Gramlich L, Dodek P; Canadian Critical Care Clinical Practice Guidelines Committee.Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. JPEN J Parenter Enteral Nutr. 2003 Sep-Oct; 27(5):355-73. • Charney P. Nutrition assessment in the 1990s: where are we now? Nutr Clin Pract. 1995 Aug; 10(4):131-9. • Planas M, Bonet A, Farré M. Valoración nutricional. Influencia de la malnutrición sobre las funciones fisiológicas. En Monografías de Medicina Crítica Práctica SEMICYUC. García de Lorenzo A. Soporte Nutricional en el paciente grave. EdikaMed 2002.

Indicator number 56 (fundamental indicator)

Name of the indicator	EARLY ENTERAL NUTRITION
Dimension	Effectiveness and risk
Justification	Early initiation of enteral nutrition (EN) has been associated with a reduction in infectious complications and mortality in critical patients in the first 48 hrs. It has not been associated to longer stays.
Formula	No. of patients with early initiation of EN ---------- x 100 No. of patients with EN
Explanation of the terminology	Early initiation: with 24 hrs of the indication for EN Indication for EN: all patients without contraindications for EN in whom a complete oral diet is not possible
Population	All patients discharged from the ICU undergoing EN at some time during their stay, during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Heyland DK, Dhaliwal R, Drover JW, Gramlich L, Dodek P; Canadian Critical Care Clinical Practice Guidelines Committee.Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. JPEN J Parenter Enteral Nutr. 2003 Sep-Oct; 27(5):355-73. • Kompan L, Kremzar B, Gadzijev E, Prosek M. Effects of early enteral nutrition on intestinal permeability and the development of multiple organ failure after multiple injuries. Intensive Care Med. 1999 Feb; 25(2):157-61.

Indicator number 57

Name of the indicator	MONITORIZATION OF ENTERAL NUTRITION
Dimension	Effectiveness
Justification	Tolerance to enteral nutrition (EN) enables the goals for caloric and nutrient intake to be reached effectively. It is important to identify the presence of factors that can act as potential barriers to the tolerance of EN and to correct the dietary prescription, as well as to identify potentially associated complications.
Formula	No. of patients with EN correctly monitored ---------- x 100 No. of patients admitted with EN
Explanation of the terminology	Monitorization of EN must include each and every one of the following: • Amount administered in 24 hrs • Checking the position of the catheter • Checking tolerance: gastric retention / 6 hrs and appearance of diarrhea, nausea, vomiting, abdominal distension, abdominal pain, and constipation • Control of glycemia, glucosuria, and ketonuria / 6 hrs • Ionogram / 24 hrs (initially) • Triglycerides, cholesterol, proteinogram /7 days • Evaluation of regurgitation or bronchoaspiration
Population	All patients admitted to the ICU with EN during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Ordoñez J, Morán V, Ruiz S. Nutrición enteral: indicaciones, vías y complicaciones. In Monografías de Medicina Crítica Práctica SEMICYUC. Soporte nutricional en el paciente grave. 2002. • Heyland DK, Dhaliwal R, Drover JW, Gramlich L, Dodek P; Canadian Critical Care Clinical Practice Guidelines Committee.Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. JPEN J Parenter Enteral Nutr. 2003 Sep-Oct; 27(5):355-73.

Indicator number 58

Name of the indicator	CALORIE AND PROTEIN REQUIREMENTS
Dimension	Appropriateness and risk
Justification	In many patients undergoing artificial nutrition (AN), the calorie and protein requirements are not calculated or are calculated empirically without taking into account anthropometric parameters, prior state of malnutrition, and more importantly in critical patients, the degree of aggression. Moreover, the calories and proteins provided can be underestimated or overestimated, leading to a state of malnutrition or hypernutrition with a clear risk of developing the refeeding syndrome.
Formula	No. of patients with NA whose requirements are correctly calculated ---------- x 100 No. of patients with NA
Explanation of the terminology	The calorie and protein requirements can be correctly calculated using one of the following methods: • The Harris-Benedict formula or other formulas (Ireton-Jones equation; Roza equation, Cléber equation; Quebbeman equation, etc.) • Open-circuit indirect calorimetry (indicates total Kcal and provides information on the oxidation of substrates) • Degree of aggression: Cerra modified by the Metabolism and Nutrition Work Group (Establishes the total calories provided, indicates non-protein calories (kcalnp) according to weight and degree of aggression and establishes the proteins provided in function of these parameters and the proportion of kcalnp to grams of nitrogen). Calculations should be repeated every 4 days or each time there is a significant change in the patient's clinical condition.
Population	All patients in the ICU with AN during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	80%
Commentaries	References: • II Conferencia de Consenso de la SEMICYUC sobre Respuesta a la agresión: Valoración e implicaciones terapéuticas. Med Intensiva 1997; 21:13-28. • García de Lorenzo A, Fernández J, Quintana M. Necesidades nutrometabólicas y cálculo de requerimientos. Monografías de Medicina Crítica Práctica SEMICYUC: Soporte Nutricional en el Paciente Grave. 2002. • Heyland DK, Dhaliwal R, Drover JW, Gramlich L, Dodek P; Canadian Critical Care Clinical Practice Guidelines Committee.Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. JPEN J Parenter Enteral Nutr. 2003 Sep-Oct; 27(5):355-73.

Indicator number 59 (fundamental indicator)

Name of the indicator	PROPHYLAXIS AGAINST GASTROINTESTINAL HEMORRHAGE IN PATIENTS UNDERGOING INVASIVE MECHANICAL VENTILATION (MV)
Dimension	Risk and effectiveness
Justification	Gastrointestinal hemorrhage (GIH) is a common complication in critical patients. The main cause is stress-related acute lesions of the gastric mucosa. Different strategies have proven effective in the prevention of GIH in selected critical patients, such as those on invasive MV > 48 hrs. The appearance of GIH increases the risk of death and prolongs the stay in hospital.
Formula	No. of patients with invasive MV>48 hrs and GIH prophylaxis ---------- x 100 Total no. of patients with invasive MV>48 hrs
Explanation of the terminology	GIH prophylaxis: protocolized administration from the initiation of invasive MV of one of the following: • protein pump inhibitors • sucralfate • H2O inhibitors • enteral nutrition aiming to prevent GIH No administration during a period > 24 hrs. should be counted as no prophylaxis.
Population	All patients in the ICU undergoing invasive MV during the period reviewed. Exclusion criterion: invasive MV < 48 hrs.
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • Cook D, Guyatt G, Marshall J, Leasa D, Fuller H, Hall R, Peters S, Rutledge F, Griffith L, McLellan A, Wood G, Kirby A. A comparison of sucralfate and ranitidine for the prevention of upper gastrointestinal bleeding in patients requiring mechanical ventilation. Canadian Critical Care Trials Group.N Engl J Med. 1998 Mar 19;338(12):791-7. • Cook DJ, Fuller HD, Guyatt GH, Marshall JC, Leasa D, Hall R, Winton TL, Rutledge F, Todd TJ, Roy P, Lacroix J, Griffith L, Willam A. Risk factors for gastrointestinal bleeding in critically ill patients. Canadian Critical Care Trials Group. N Engl J Med. 1994 Feb 10; 330(6):377-81. • Cook DJ, Griffith LE, Walter SD, Guyatt GH, Meade MO, Heyland DK, Kirby A, Tryba M; Canadian Critical Care Trials Group.The attributable mortality and length of intensive care unit stay of clinically important gastrointestinal bleeding in critically ill patients. Crit Care. 2001 Dec; 5(6):368-75.

Indicator number 60

Name of the indicator	INDICATIONS FOR CONTINUOUS DIALYSIS
Dimension	Effectiveness
Justification	Continuous dialysis techniques yield better results for morbidity and mortality than intermittent techniques in critical patients with kidney failure. Continuous dialysis is especially indicated in: • Cardiovascular dysfunction = need for vasoactive support • Multiple organ failure • Intracranial hypertension
Formula	No. of continuous dialysis treatments ---------- x 100 Total no. of dialysis treatments
Explanation of the terminology	Continuous treatment: set of sessions administered to a patient for an indication. If the modality is changed, it is considered a new treatment.
Population	All dialysis treatments during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	80-90%
Commentaries	References: • Kellum JA, Angus DC, Johnson JP, Leblanc M, Griffin M, Ramakrishnan N, Linde-Zwirble WT.Continuous versus intermittent renal replacement therapy: a meta-analysis. Intensive Care Med. 2002 Jan; 28(1):29-37. • Augustine JJ, Sandy D, Seifert TH, Paganini EP. A randomized controlled trial comparing intermittent with continuous dialysis in patients with ARF. Am J Kidney Dis. 2004 Dec; 44(6):1000-7. • Van Biesen W, Vanholder R, Lameire N.Dialysis strategies in critically ill acute renal failure patients.Curr Opin Crit Care. 2003 Dec; 9(6):491-5. • Tonelli M, Manns B, Feller-Kopman D.Acute renal failure in the intensive care unit: a systematic review of the impact of dialytic modality on mortality and renal recovery. Am J Kidney Dis. 2002 Nov; 40(5):875-85.

Indicator number 61

Name of the indicator	DOPAMINE USE IN ACUTE RENAL FAILURE (ARF)
Dimension	Risk and effectiveness
Justification	Dopamine at renal doses (< 5ug/kg/min) has not proven to be effective for prophylaxis or treatment of ARF. Moreover, its possible adverse effects are well known and more unpredictable in ARF due to the lower rate of clearing of this molecule in this condition.
Formula	$\frac{\text{No. of patients treated with renal doses of dopamine}}{\text{Total no. of patients discharged from the ICU}} \times 100$
Explanation of the terminology	Renal dose of dopamine: perfusion of dopamine < 5mgr/kg/min indicated for prophylaxis against ARF or treatment of ARF.
Population	All patients discharged from the ICU during the period reviewed. • Exclusion criterion: use of dopamine for other indications apart from ARF
Type	Process
Source of data	Clinical records
Standard	0%
Commentaries	References: • Kellum JA, M Decker J. Use of dopamine in acute renal failure: a meta-analysis. Crit Care Med. 2001 Aug; 29(8):1526-31. • Holmes CL, Walley KR. Bad medicine: low-dose dopamine in the ICU.Chest. 2003 Apr; 123(4):1266-75. • Bellomo R, Chapman M, Finfer S, Hickling K, Myburgh J. Low-dose dopamine in patients with early renal dysfunction: a placebo-controlled randomised trial. Australian and New Zealand Intensive Care Society (ANZICS) Clinical Trials Group.Lancet. 2000 Dec 23-30; 356(9248):2139-43.

Indicator number 62

Name of the indicator	INCIDENCE OF ACUTE RENAL FAILURE (ARF) IN NON-CORONARY CRITICAL PATIENTS
Dimension	Risk and efficiency
Justification	The development of ARF in "non-coronary" critical patients is a serious complication that doubles the probability of death. It also entails increased consumption of resources.
Formula	No. of non-coronary patients with ARF ---------- x 100 Total no. of non-coronary patients discharged from the ICU
Explanation of the terminology	• Glomerular filtrate rate (GFR) (mL/min)=[(Urine creatine/plasma creatine) x urine volume (mL)] / minutes • ARF = GFR < 10 mL/min • Non-coronary patients: All patients without acute coronary syndrome
Population	All non-coronary patients admitted to the ICU during the period reviewed. • Exclusion criterion: chronic renal insufficiency
Type	Outcome
Source of data	Clinical records
Standard	10%
Commentaries	The standard is based on an epidemiological study carried out by the SEMICYUC during 1999-2000. References: • de Mendonca A, Vincent JL, Suter PM, Moreno R, Dearden NM, Antonelli M, Takala J, Sprung C, Cantraine F.Acute renal failure in the ICU: risk factors and outcome evaluated by the SOFA score. Intensive Care Med. 2000 Jul; 26(7):915-21. • Kellum JA, Leblanc M, Gibney RT, Tumlin J, Lieberthal W, Ronco C. Primary prevention of acute renal failure in the critically ill. Curr Opin Crit Care. 2005 Dec; 11(6):537-541. • Schetz M. Epidemiología de fracaso renal agudo en la unidad de cuidados intensivos. En: Net A, Roglan A. Depuración extrarenal en el paciente grave 2004; Masson SA. Barcelona. P.99-108.

Indicator number 63

Name of the indicator	INCIDENCE OF ACUTE RENAL FAILURE (ARF) IN CORONARY PATIENTS
Dimension	Risk and efficiency
Justification	The development of ARF in "coronary" patients is a rare complication that doubles the probability of death. It also entails increased consumption of resources.
Formula	No. coronary patients with ARF ---------- x 100 Total no. of coronary patients discharged from the ICU
Explanation of the terminology	• ARF = GFR < 10 mL/min • GFR: Glomerular filtrate: (mL/min)=[(Urine creatine/plasma creatine) x urine volume (mL)] / minutes
Population	All coronary patients diagnosed of acute coronary syndrome admitted to the ICU during the period reviewed. • Exclusion criterion: chronic renal insufficiency
Type	Outcome
Source of data	Clinical records
Standard	5%
Commentaries	The standard is based on an epidemiological study carried out by the SEMICYUC during 1999-2000. References: • de Mendonca A, Vincent JL, Suter PM, Moreno R, Dearden NM, Antonelli M, Takala J, Sprung C, Cantraine F.Acute renal failure in the ICU: risk factors and outcome evaluated by the SOFA score. Intensive Care Med. 2000 Jul; 26(7):915-21. • Kellum JA, Leblanc M, Gibney RT, Tumlin J, Lieberthal W, Ronco C. Primary prevention of acute renal failure in the critically ill. Curr Opin Crit Care. 2005 Dec; 11(6):537-541. • Schetz M. Epidemiología de fracaso renal agudo en la unidad de cuidados intensivos. En: Net A, Roglan A. Depuración extrarenal en el paciente grave 2004; Masson SA. Barcelona. P.99-108.

Indicator number 64

Name of the indicator	PREVENTION OF CONTRAST-INDUCED NEPHROPATHY IN CORONARIOGRAPHY
Dimension	Risk
Justification	Contrast-induced nephropathy is a common cause of acute renal failure. It has been associated to increased morbidity, mortality, and length of hospital stay in patients undergoing coronariography. The main risk factor for the development of nephrotoxicity is pre-existent renal insufficiency (RI). Ensuring correct hydration before and after the procedure has been shown to reduce the risk of nephrotoxicity.
Formula	No. patients with pre-existent RI undergoing coronariography with correct hydration ---------- x 100 No. patients with pre-existent RI undergoing coronary angiography
Explanation of the terminology	Pre-existent RI: creatine > 2 mg/dl • Exclusion criterion: patients requiring dialysis prior to the procedure Correct hydration: administration of 1 ml/kg/h 0.45% saline solution during the 12 hrs prior to the procedure and 12 hrs after the procedure.
Population	Patients with pre-existent RI undergoing coronariography during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	90%
Commentaries	References: • Solomon R, Werner C, Mann D, D'Elia J, Silva P.Effects of saline, mannitol, and furosemide to prevent acute decreases in renal function induced by radiocontrast agents. N Engl J Med. 1994 Nov 24; 331(21):1416-20. • Levine GN, Kern MJ, Berger PB, Brown DL, Klein LW, Kereiakes DJ, Sanborn TA, Jacobs AK; American Heart Association Diagnostic and Interventional Catheterization Committee and Council on Clinical Cardiology.Management of patients undergoing percutaneous coronary revascularization. Ann Intern Med. 2003 Jul 15;139(2):123-36 • Gleeson TG, Bulugahapitiya S. Contrast-induced nephropathy.AJR Am J Roentgenol. 2004 Dec; 183(6):1673-89. Although not supported by the same level of evidence, the authors recommend the administration of acetylcysteine. • Kay J, Chow WH, Chan TM, Lo SK, Kwok OH, Yip A, Fan K, Lee CH, Lam WF. Acetylcysteine for prevention of acute deterioration of renal function following elective coronary angiography and intervention: a randomized controlled trial. JAMA. 2003 Feb 5; 289(5):553-8.

Indicator number 65

Name of the indicator	ASSESSMENT OF ACUTE RENAL FAILURE (ARF) IN CRITICAL PATIENTS
Dimension	Appropriateness
Justification	Correct stratification of ARF requires accurate diagnostic tools that are easy to use at the bedside. In critical patients, the most efficient (complexity/accuracy/clinical usefulness) way to assess renal function is by calculating the glomerular filtrate rate (GFR) and to determine whether deterioration is functional or parenchymal is by measuring the fractional excretion of sodium (FENa). Stratification should not be based on plasma levels of molecules whose concentration can vary, not only in function of their elimination, but also in function of their production.
Formula	$\frac{\text{No. patients with ARF and GFR and FENa determinations}}{\text{No. patients with ARF discharged from the ICU}} \times 100$
Explanation of the terminology	Glomerular filtrate rate(GFR) (mL/min)=[(Urine creatine/plasma creatine) x urine volume (mL)] / minutes Where: • urine creatine is the mean creatine of all urine collected in the desired time period (ideally 24 hrs) • plasma creatine is the mean of the creatine at the start of urine collection and the creatine and the end of urine collection • urine volume is the total volume collected over the period selected • minutes: total minutes comprising the chosen period (24 hrs = 1440 minutes) FENa (%) = [(plasma creatine x urine Na)/(urine creatine x plasma Na)] x 100
Population	Patients with ARF discharged from the ICU during the period reviewed. • Inclusion criteria: all patients with main or secondary diagnosis of ARF in the report at discharge.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Mehta RL, Chertow GM. Acute renal failure definitions and classification: time for change? J Am Soc Nephrol. 2003 Aug; 14(8):2178-87. • Bellomo R, Ronco C, Kellum JA, Mehta RL, Palevsky P; Acute Dialysis Quality Initiative workgroup. Acute renal failure - definition, outcome measures, animal models, fluid therapy and information technology needs: the Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. Crit Care. 2004 Aug; 8(4):R204-12.

Indicator number 66

Name of the indicator	MONITORIZATION OF SEDATION
Dimension	Risk and effectiveness
Justification	Inappropriate sedation (both over- and undersedation) has adverse effects on mechanically ventilated patients, including prolongation of mechanical ventilation (MV) and hospital stays, as well as increased morbidity, mortality, and use of resources. The use of validated sedation scales has proven useful in the management of these patients, and their use is recommended in clinical practice guides.
Formula	$\frac{\text{No. of 6-hr periods of monitored MV}}{\text{No. of 6-hr periods of MV and continuous sedation (days of MV and continuous sedation x 4)}} \times 100$
Explanation of the terminology	Monitorization: evaluation of the level of sedation using a validated scale (e.g. Ramsay, RASS, MAAS) every 6 hrs or when the clinical situation changes. Inclusion criteria: • MV: > 12 hrs • Continuous sedation
Population	All 6-hr periods (or days x4) of continuously sedated mechanically ventilated patients during the period reviewed.
Type	Process
Source of data	Clinical records (Nursing registries)
Standard	95%
Commentaries	Acronyms for the scales: • Riker Sedation-Agitation Scale (SAS) • Motor Activity Assessment Scale (MAAS) • Vancouver Interaction and Calmness Scale (VICS) References: • Pronovost PJ, Berenholtz SM, Ngo K, McDowell M, Holzmueller C, Haraden C, Resar R, Rainey T, Nolan T, Dorman T. Developing and pilot testing quality indicators in the intensive care unit. J Crit Care. 2003 Sep; 18(3):145-55. • Jacobi J, Fraser GL, Coursin DB, Riker RR, Fontaine D, Wittbrodt ET, Chalfin DB, Masica MF, Bjerke HS, Coplin WM, Crippen DW, Fuchs BD, Kelleher RM, Marik PE, Nasraway SA Jr, Murray MJ, Peruzzi WT, Lumb PD; Task Force of the American College of Critical Care Medicine (ACCM) of the Society of Critical Care Medicine (SCCM), American Society of Health-System Pharmacists (ASHP), American College of Chest Physicians.Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. Crit Care Med. 2002 Jan; 30(1):119-41. • Carrasco G. Instruments for monitoring intensive care unit sedation. Crit Care. 2000; 4(4):217-25. • De Jonghe B, Cook D, Appere-De-Vecchi C, Guyatt G, Meade M, Outin H.Using and understanding sedation scoring systems: a systematic review. Intensive Care Med. 2000 Mar; 26(3):275-85.

Indicator number 67 (fundamental indicator)

Name of the indicator	APPROPRIATE SEDATION
Dimension	Risk and effectiveness
Justification	Inappropriate sedation (both over- and undersedation) has adverse effects on mechanically ventilated patients. Inappropriately low levels of sedation increase oxygen requirements, favor pain and agitation, hinder mechanical ventilation (MV), and increase the risk of accidental extubation. Excessive sedation leads to hypotension, bradycardia, intestinal paralysis, venous stasis, hinders neurologic assessment, prolongs MV and hospital stay, and increases the consumption of resources.
Formula	No. of mechanically ventilated patients with appropriate sedation ---------- x 100 No. of mechanically ventilated patients with sedation
Explanation of the terminology	Appropriate sedation: maintaining at least 80% of the successive results on the sedation scales within the prescribed range for each patient Inclusion criteria: • MV: > 24 hrs • Continuous sedation
Population	All continuously sedated mechanically ventilated patients during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	85%
Commentaries	References: • Egerod I. Uncertain terms of sedation in ICU. How nurses and physicians manage and describe sedation for mechanically ventilated patients. J Clin Nurs. 2002 Nov; 11(6):831-40. • Jacobi J, Fraser GL, Coursin DB, Riker RR, Fontaine D, Wittbrodt ET, Chalfin DB, Masica MF, Bjerke HS, Coplin WM, Crippen DW, Fuchs BD, Kelleher RM, Marik PE, Nasraway SA Jr, Murray MJ, Peruzzi WT, Lumb PD; Task Force of the American College of Critical Care Medicine (ACCM) of the Society of Critical Care Medicine (SCCM), American Society of Health-System Pharmacists (ASHP), American College of Chest Physicians.Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. Crit Care Med. 2002 Jan; 30(1):119-41.

Indicator number 68

Name of the indicator	DAILY INTERRUPTION OF SEDATION
Dimension	Effectiveness and efficiency
Justification	Daily interruption of sedation in critical patients undergoing mechanical ventilation (MV) is associated to a decrease in the duration of MV, and in ICU stay. Moreover, there are no associations with late psychological sequelae.
Formula	$\frac{\text{No. of days in which sedation is interrupted}}{\text{No. of days of MV under sedation}} \times 100$
Explanation of the terminology	Interruption of sedation: suspension/decrease in the sedation regimen until the patient regains consciousness, obeys orders, or until agitation appears.
Population	All days of MV under sedation during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	80%
Commentaries	The authors would like to emphasize that the references expressly state that there are no exclusion criteria for daily interruption of sedation in this type of patients. References: • Kress JP, Pohlman AS, O'Connor MF, Hall JB.Daily interruption of sedative infusions in critically ill patients undergoing mechanical ventilation. N Engl J Med. 2000 May 18; 342(20):1471-7. • Kress JP, Gehlbach B, Lacy M, Pliskin N, Pohlman AS, Hall JB.The long-term psychological effects of daily sedative interruption on critically ill patients. Am J Respir Crit Care Med. 2003 Dec 15; 168(12):1457-61. • Schweickert WD, Gehlbach BK, Pohlman AS, Hall JB, Kress JP.Daily interruption of sedative infusions and complications of critical illness in mechanically ventilated patients. Crit Care Med. 2004 Jun; 32(6):1272-6.

Indicator number 69 (fundamental indicator)

Name of the indicator	PAIN MANAGEMENT IN UNSEDATED PATIENTS
Dimension	Effectiveness and risk
Justification	Critical patients are exposed to multiple pain-causing stimuli. Inadequate pain control causes stress and increases morbidity. Freedom from pain should be a quality-of-care objective in the ICU. Monitoring pain should include measurement on a validated scale until the desired level of analgesia is achieved and maintained.
Formula	No. of patients monitored according to the protocol ---------- x 100 No. of patients without sedation that might require analgesia
Explanation of the terminology	Patients that might require analgesia: all patients admitted to the ICU Monitored according to the protocol: • Pain should be measured on a validated scale (e.g. VAS, NRS) 3 times per day (every 8 hrs). • VAS or NRS scores should not be higher than 3 more than once ever 24 hrs.
Population	All patients discharged from the ICU during the period reviewed. Exclusion criteria: Sedation by continuous perfusion + mechanical ventilation
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	Explanations of the acronyms for the scales: VAS: Visual analog scale NRS: Numerical rating scale The authors consider the indicator to be fulfilled when at least two thirds of the measurements planned are carried out during the entire stay (and analgesics administered if the results so indicate). References: • Jacobi J, Fraser GL, Coursin DB, Riker RR, Fontaine D, Wittbrodt ET, Chalfin DB, Masica MF, Bjerke HS, Coplin WM, Crippen DW, Fuchs BD, Kelleher RM, Marik PE, Nasraway SA Jr, Murray MJ, Peruzzi WT, Lumb PD; Task Force of the American College of Critical Care Medicine (ACCM) of the Society of Critical Care Medicine (SCCM), American Society of Health-System Pharmacists (ASHP), American College of Chest Physicians.Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. Crit Care Med. 2002 Jan; 30(1):119-41. • Joint Commission Accreditation of Health Care Organizations. Pain Assessment and management standards-hospitals. Available at http://www.jacho.org

Indicator number 70

Name of the indicator	PAIN MANAGEMENT IN VENTILATED PATIENTS
Dimension	Effectiveness
Justification	Pain is a prevalent symptom in the ICU; it affects over 70% of patients and must be treated appropriately. Inadequate pain control causes stress and increases morbidity. Pain in patients that are unable to express themselves might not be observed.
Formula	No. of mechanically ventilated patients administered analgesics ---------- x 100 No. of mechanically ventilated patients with cognitive deterioration
Explanation of the terminology	Administered analgesics: according to the protocol in effect with respect to indication, type of drug, dose, method of administration, and interval. Cognitive deterioration: unable to express or show the presence of pain and / or undergoing pharmacologic sedation.
Population	All mechanically ventilated patients with cognitive deterioration discharged from the ICU during the period reviewed. Exclusion criteria: • brain death • vegetative state
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Watling SM, Dasta JF, Seidl EC.Sedatives, analgesics, and paralytics in the ICU. Ann Pharmacother. 1997 Feb; 31(2):148-53. • Jacobi J, Fraser GL, Coursin DB, Riker RR, Fontaine D, Wittbrodt ET, Chalfin DB, Masica MF, Bjerke HS, Coplin WM, Crippen DW, Fuchs BD, Kelleher RM, Marik PE, Nasraway SA Jr, Murray MJ, Peruzzi WT, Lumb PD; Task Force of the American College of Critical Care Medicine (ACCM) of the Society of Critical Care Medicine (SCCM), American Society of Health-System Pharmacists (ASHP), American College of Chest Physicians.Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. Crit Care Med. 2002 Jan; 30(1):119-41. • Chamorro C, Romera MA, Silva JA. Importancia de la sedoanalgesia en los enfermos en ventilación mecánica. Med Intensiva 2003;1(Supl 1):1-2.

Indicator number 71

Name of the indicator	INAPPROPRIATE USE OF MUSCLE RELAXANTS
Dimension	Risk
Justification	The incorrect use of neuromuscular-blocking drugs can be associated to serious complications. Clinical practice guides recommend using muscle relaxants only in specific clinical situations (difficulties in mechanical ventilation, tetanus, increased intracranial pressure, and decreased oxygen consumption) and only after other measures have failed. (Grade C recommendation).
Formula	No. of mechanically ventilated patients with PO2/FiO2 > 200 and continuous muscle relaxation ---------- x 100 No. of mechanically ventilated patients with PO2/FiO2 > 200
Explanation of the terminology	Continuous muscle relaxation: includes bolus administration at intervals $\leq$ 2 hrs.
Population	All mechanically ventilated patients with PO2/FiO2 > 200 during the period reviewed. Exclusion criteria: • difficulties in mechanical ventilation with PO2/FiO2 > 200 • tetanus • intracranial hypertension
Type	Process
Source of data	Clinical records
Standard	2%
Commentaries	References: • Klessig HT, Geiger HJ, Murray MJ, Coursin DB.A national survey on the practice patterns of anesthesiologist intensivists in the use of muscle relaxants. Crit Care Med. 1992 Sep; 20(9):1341-5. • Murray MJ, Cowen J, DeBlock H, Erstad B, Gray AW Jr, Tescher AN, McGee WT, Prielipp RC, Susla G, Jacobi J, Nasraway SA Jr, Lumb PD; Task Force of the American College of Critical Care Medicine (ACCM) of the Society of Critical Care Medicine (SCCM), American Society of Health-System Pharmacists, American College of Chest Physicians.Clinical practice guidelines for sustained neuromuscular blockade in the adult critically ill patient.Crit Care Med. 2002 Jan;30(1):142-56 • Murphy GS, Vender JS.Neuromuscular-blocking drugs. Use and misuse in the intensive care unit.Crit Care Clin. 2001 Oct; 17(4):925-42.

Indicator number 72

Name of the indicator	MONITORIZATION OF NEUROMUSCULAR BLOCKAGE (NMB)
Dimension	Effectiveness and risk
Justification	The use of neuromuscular-blocking drugs can be associated to serious complications. Clinical practice guides recommend monitoring neuromuscular blockage: it enables the dose administered to be adjusted and unwanted effects to be controlled (Grade C recommendation).
Formula	$\frac{\text{No. of patients with continuous NMB monitored}}{\text{No. of patients with continuous NMB}} \times 100$
Explanation of the terminology	Monitorization of NMB: periodic clinical evaluation and Train-of-four (TOF) measurements
Population	All patients with continuous NMB during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Murray MJ, Cowen J, DeBlock H, Erstad B, Gray AW Jr, Tescher AN, McGee WT, Prielipp RC, Susla G, Jacobi J, Nasraway SA Jr, Lumb PD; Task Force of the American College of Critical Care Medicine (ACCM) of the Society of Critical Care Medicine (SCCM), American Society of Health-System Pharmacists, American College of Chest Physicians.Clinical practice guidelines for sustained neuromuscular blockade in the adult critically ill patient.Crit Care Med. 2002 Jan;30(1):142-56 • Pino RM. Neuromuscular blockade studies of critically ill patients. Intensive Care Med. 2002 Dec; 28(12):1695-7. • Lagneau F, D'honneur G, Plaud B, Mantz J, Gillart T, Duvaldestin P, Marty J, Clyti N, Pourriat JL.A comparison of two depths of prolonged neuromuscular blockade induced by cisatracurium in mechanically ventilated critically ill patients.Intensive Care Med. 2002 Dec; 28(12):1735-41.

Indicator number 73

Name of the indicator	IDENTIFICATION OF DELIRIUM
Dimension	Effectiveness
Justification	Delirium has a high incidence; it is associated to significant morbidity and increased costs in critical patients. It can be difficult to identify and the use of systems that allow it to be identified and treated appropriately is recommended. The Confusion Assessment Method for the ICU (CAM-ICU) has proven useful in the diagnosis of delirium in critical patients.
Formula	$\frac{\text{No. of mechanically ventilated patients evaluated for the presence of delirium}}{\text{No. of patients mechanically ventilated > 48 hrs}} \times 100$
Explanation of the terminology	Evaluated for the presence of delirium: daily assessment with the CAM
Population	All patients with mechanical ventilation > 48 hrs during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	90%
Commentaries	References: • Ely EW, Shintani A, Truman B, Speroff T, Gordon SM, Harrell FE Jr, Inouye SK, Bernard GR, Dittus RS. Delirium as a predictor of mortality in mechanically ventilated patients in the intensive care unit. JAMA. 2004 Apr 14; 291(14):1753-62. • Milbrandt EB, Deppen S, Harrison PL, Shintani AK, Speroff T, Stiles RA, Truman B, Bernard GR, Dittus RS, Ely EW.Costs associated with delirium in mechanically ventilated patients. Crit Care Med. 2004 Apr; 32(4):955-62. • Ely EW, Gautam S, Margolin R, Francis J, May L, Speroff T, Truman B, Dittus R, Bernard R, Inouye SK.The impact of delirium in the intensive care unit on hospital length of stay.Intensive Care Med. 2001 Dec; 27(12):1892-900.

Indicator number 74

Name of the indicator	INFORMED CONSENT (IC) FOR TRANSFUSION OF BLOOD COMPONENTS
Dimension	Satisfaction and appropriateness
Justification	The administration of blood components is a therapeutic procedure that involves a risk to the patient's health. Current legislation requires written consent before performing this procedure. Failure to ask for written consent violates the patient's right to autonomy and that of his family.
Formula	$\frac{\text{No. of patients administered blood components in the ICU after obtaining written IC}}{\text{No. of patients administered blood components in the ICU}} \times 100$
Explanation of the terminology	Blood components: packed red blood cells, plasma, platelet-rich plasma Written IC: stating the need for transfusion, its risks, and alternatives. The document must be understood and signed by the patient or his legal representative. It may be registered directly in the patient's history. Life-threatening emergency: clinical situation requiring immediate transfusion of blood components in which it is impossible to inform the patient, legal representative or family.
Population	All patients administered blood components for the first time in the ICU during the period reviewed. Exclusion criterion: life-threatening emergencies (the family must be informed as soon as possible)
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • Spanish law 41/2002 regulating patients' autonomy and rights, and obligations regarding information and clinical documentation (November 2002). BOE 15 November 2002. • Royal decree 1854/1993. BOE 20 November 1993; num 278 (page 32630). • Solsona JF, Cabré L, Abizanda R, Campos JM, Sainz A, Martín MC, Sánchez JM, Bouza C, Quintana M, Saralegui I, Monzón JL y grupo de bioética de la SEMICYUC. Recomendaciones del grupo de bioética de la SEMICYUC sobre el Consentimiento Informado en UCI. Med Intensiva 2002; 26(5):254-255.

Indicator number 75

Name of the indicator	INAPPROPRIATE TRANSFUSION OF FRESH-FROZEN PLASMA (FFP)
Dimension	Effectiveness and risk
Justification	FFP is thought to be the blood component that is most often transfused erroneously. Transfusion of FFP can have the same adverse effects as transfusion of red-blood-cell concentrates. Transfusion of FFP is rarely if ever indicated in patients without blood loss and without lengthened coagulation times.
Formula	$\frac{\text{No. of patients without bleeding and with normal coagulation times administered FFP}}{\text{No. of patients administered FFP}} \times 100$
Explanation of the terminology	Normal coagulation times: (Prothrombin time (PT) > 70% and/or partial thromboplastin time (PTT) $\leq$ 1.5 times the control.
Population	All patients transfused with FFP during the period reviewed. Exclusion criterion: patients without bleeding needing to undergo surgery in whom FFP is administered to reverse the effects of oral anticoagulation
Type	Process
Source of data	Clinical records
Standard	0%
Commentaries	References: • Nuttall GA, Stehling LC, Beighley CM, Faust RJ; American Society of Anesthesiologists Committee on Transfusion Medicine. Current transfusion practices of members of the american society of anesthesiologists: a survey. Anesthesiology. 2003 Dec; 99(6):1433-43. • Rossi U, Van Aken WG, Martín-Vega C. European School of Transfusion Medicine. Transfusion Medicine in clinical practice in the year 2000. Proceedings of the educational course of the 4th ISBT Regional (3rd European) Congress. Barcelona 1993. • Madoz P, Litvan H, Casas JI. Indicaciones de la trasfusión de plasma fresco. En: hemostasia y Medicina Trasfusional perioperatoria. Llau Pitarch. Aran 2003. Madrid.

Indicator number 76

Name of the indicator	INAPPROPRIATE TRANSFUSION OF PLATELET –RICH PLASMA (PRP)
Dimension	Effectiveness and risk
Justification	Transfusion of PRP is common in critical patients. The indications for this procedure are limited to bleeding patients with platelet deficiency and or platelet dysfunction. Transfusion of PRP can have the same adverse effects as transfusion of red-blood-cell concentrates or plasma, with the additional risks that the patient is exposed to multiple donors and that this product is not frozen (greater possibility of bacterial contamination).
Formula	No. of patients without bleeding and without platelet deficiency and/or dysfunction transfused with PRP ---------- x 100 No. of patients transfused with PRP
Explanation of the terminology	Platelet deficiency: platelet count < 80,000/ml Platelet dysfunction: meeting one of the following criteria • ingestion of platelet aggregation inhibitors in the 10 previous days • having undergone extracorporeal circuit
Population	All patients transfused with PRP during the period reviewed. Exclusion criterion: patients without bleeding needing to undergo surgery with platelet deficiency and/or dysfunction
Type	Process
Source of data	Clinical records
Standard	0%
Commentaries	References: • Nuttall GA, Stehling LC, Beighley CM, Faust RJ; American Society of Anesthesiologists Committee on Transfusion Medicine. Current transfusion practices of members of the American society of anesthesiologists: a survey. Anesthesiology. 2003 Dec; 99(6):1433-43. • Rossi U, Van Aken WG, Martín-Vega C. European School of Transfusion Medicine. Transfusion Medicine in clinical practice in the year 2000. Proceedings of the educational course of the 4th ISBT Regional (3rd European) Congress. Barcelona 1993. • Madoz P, Litvan H, Casas JI. Indicaciones de la trasfusión de plasma fresco. En: hemostasia y Medicina Trasfusional perioperatoria. Llau Pitarch. Aran 2003. Madrid.

Indicator number 77 (fundamental indicator)

Name of the indicator	INAPPROPRIATE TRANSFUSION OF PACKED RED BLOOD CELLS (PRBC)
Dimension	Effectiveness and risk
Justification	Transfusion with a hemoglobin threshold > 9 gm/dL has not been proven efficacious in reducing morbidity and mortality. Restrictive transfusion policies (Hb < 7 gm/dL) reduce morbidity and mortality at 30 and 60 days in young patients (< 55 yrs) of moderate severity (APACHE < 20). In patients undergoing heart surgery, transfusion with a threshold of 8 gm/dL has proven to be safe.
Formula	No. of patients with hemoglobin prior to transfusion > 8gm/dL ---------- x 100 No. of patients transfused
Explanation of the terminology	• The maximum period between hemoglobin determination prior to transfusion and transfusion of the first concentrate is 24 hrs.
Population	All patients transfused during the period reviewed. Exclusion criterion: • massive bleeding • acute coronary syndrome • severe sepsis / septic shock in the resuscitation phase • severe hypoxemia
Type	Process
Source of data	Clinical records
Standard	5%
Commentaries	References: • Hebert PC, Wells G, Blajchman MA, Marshall J, Martin C, Pagliarello G, Tweeddale M, Schweitzer I, Yetisir E.A multicenter, randomized, controlled clinical trial of transfusion requirements in critical care. Transfusion Requirements in Critical Care Investigators, Canadian Critical Care Trials Group. N Engl J Med. 1999 Feb 11;340(6):409-17 • Bracey AW, Radovancevic R, Riggs SA, Houston S, Cozart H, Vaughn WK, Radovancevic B, McAllister HA Jr, Cooley DA.Lowering the hemoglobin threshold for transfusion in coronary artery bypass procedures: effect on patient outcome. Transfusion. 1999 Oct; 39(10):1070-7. • Leal Noval SR, Muñoz Gómez M, Campanario García A. Trasfusión en el paciente crítico. Med Intensiva 2004, 28:464-469.

Indicator number 78

Name of the indicator	APPROPRIATE DIGESTIVE DECONTAMINATION (DD) IN INTOXICATIONS BY INGESTION
Dimension	Effectiveness and risk
Justification	Appropriate DD reduces toxicity in intoxications by oral ingestion. Delay reduces the efficacy of the measure. Its use in patients without indications can increase morbidity and mortality.
Formula	$\frac{\text{No. of intoxications by oral ingestion in which appropriate DD was performed}}{\text{No. of intoxications by oral ingestion discharged from the ICU}} \times 100$
Explanation of the terminology	• Appropriate DD: performed after evaluating the time since ingestion, type of toxin, patient's level of consciousness; as summarized in the algorithm of the consensus document (1) (See attached document).
Population	Patients intoxicated by oral ingestion discharged during the period reviewed. Exclusion criterion: • ingestion of caustic substances, whether acids or alkalines, or other corrosive substances • clinical presentation suggestive of acute abdomen • mild intoxication • excessive delay between ingestion and medical attention
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	The respiratory tract must be protected and adequate ventilation must be ensured. References: • Vale JA, Kulig K; American Academy of Clinical Toxicology; European Association of Poisons Centres and Clinical Toxicologists. Position paper: gastric lavage.J Toxicol Clin Toxicol. 2004;42(7):933-43 • Lloret J, Nogué S, Jiménez X. Protocols, Codis d'Activació i Circuits d'atenció urgent a Barcelona Ciutat. Malalt amb intoxicacions agudes greus. Consorci Sanitari de Barcelona. Barcelona 2004. • Zimmerman JL. Poisonings and overdoses in the intensive care unit: general and specific management issues.Crit Care Med. 2003 Dec;31(12):2794-801 • Amigo M, Nogue S, Sanjurjo E, Faro J, Ferro I, Miro O. Efficacy and safety of gut decontamination in patients with acute therapeutic drug overdose. [Article in Spanish]. Med Clin (Barc). 2004 Apr 10; 122(13):487-92.

Indicator number 79

Name of the indicator	MINIMUM ANTIDOTE REQUIREMENTS
Dimension	Appropriateness
Justification	The absence of essential antidotes can increase morbidity and mortality in intoxicated patients.
Formula	No. of recommended antidotes available ---------- x 100 No. of antidotes recommended according to hospital type
Explanation of the terminology	• Recommended antidotes: list elaborated by experts, adjusted for hospital type (1) (See attached document). • Expired antidotes should be considered unavailable.
Population	All antidotes included in the list of recommendations according to hospital type during the period reviewed.
Type	Structure
Source of data	Pharmacy registry
Standard	95%
Commentaries	References: • (1)Lloret J, Nogué S, Jiménez X. Protocols, Codis d'Activació i Circuits d'atenció urgent a Barcelona Ciutat. Malalt amb intoxicacions agudes greus. Consorci Sanitari de Barcelona. Barcelona 2004 • Nogue S, Munne P, Soy D, Milla J. Availability, use and cost of antidotes in Catalonia. [Article in Spanish]. Med Clin (Barc). 1998 May 9; 110(16):609-13.

Indicator number 80

Name of the indicator	EARLY HEMODIALYSIS IN ACUTE INTOXICATION
Dimension	Effectiveness
Justification	In acute intoxication meeting criteria for hemodialysis (HD), performing HD improves the prognosis. Delay reduces the efficacy of the measure.
Formula	$\frac{\text{No. of patients intoxicated with indication for HD undergoing HD within 2 hrs}}{\text{No. of patients intoxicated with indication for HD}} \times 100$
Explanation of the terminology	• Indication for HD: blood concentrations of toxin > 0.5 g/L (methanol and ethylene glycol), 3mEq/L (lithium), 80 mg/dL (aspirin), and 1000 mg/L (valproate) • within 2 hrs: from fulfillment of the criteria (blood levels) to HD
Population	Intoxicated patients fulfilling the criteria for HD during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	90%
Commentaries	References: • Nogué S, Marruecos L, Moran I, Net A. Indicaciones de la depuración extrarrenal en el tratamiento de las intoxicaciones agudas. En: Net A, Reglan A. Depuración extrarrenal en el paciente grave. Masson, SA. Barcelona 2004. Pg: 281-289. • Lloret J, Nogué S, Jiménez X. Protocols, Codis d'Activació i Circuits d'atenció urgent a Barcelona Ciutat. Malalt amb intoxicacions agudes greus. Consorci Sanitari de Barcelona. Barcelona 2004.

Indicator number 81 (fundamental indicator)

Name of the indicator	ORGAN DONORS
Dimension	Effectiveness
Justification	Organ donation is a priority program in Spain. Intensive care departments have a key role in the endeavor to obtain as many organs as possible.
Formula	$\frac{\text{No. of real donors}}{\text{No. of brain dead patients in the ICU}} \times 100$
Explanation of the terminology	• Real donor: Donor taken to the operating room for the removal of organs (even if none of the organs are then transplanted) • Potential donor: patients diagnosed of brain death without absolute contraindications for donation • Brain death: fulfilling clinical criteria and instrumental tests for brain death
Population	All patients with brain death during the period reviewed.
Type	Outcome
Source of data	Clinical records and transplantation coordinator
Standard	60%
Commentaries	References: • Seller-Pérez G, Herrera-Gutiérrez ME, Lebrón-Gallardo M, Fernández-Ortega JF, Arias-Verdú D, Mora-Ordóñez J. Organ donation in the intensive care unit. [Article in Spanish]. Med Intensiva 2004; 28(6):308-315. • Navarro A, Escalante JL, Andres A.Donor detection and organ procurement in the Madrid region. Group of Transplant Coordinators of the Region of Madrid. Transplant Proc. 1993 Dec;25(6):3130-1 • Wijdicks EF.The diagnosis of brain death. N Engl J Med. 2001 Apr 19;344(16):1215-21 • Escalante Cobo JL. Muerte Encefálica. Evolución histórica y situación actual. Med Intensiva 2000; 24(3):97-105. • Escudero Augusto D. Diagnóstico clínico de muerte encefálica. Prerrequisitos y exploración neurológica. Medicina Intensiva 2000; 24(3):106-115.

Indicator number 82

Name of the indicator	EVALUATION OF LIVER TRANSPLANTATION IN ACUTE LIVER FAILURE (ALF)
Dimension	Effectiveness
Justification	Before the introduction of liver transplantation, ALF was associated to high mortality (40-80%). Liver transplantation (LT) is currently the only curative treatment for ALF, with a survival rate of 70% or higher vs. 10-15% with conventional treatment. Early diagnosis of ALF is essential. The King's College London and/or Clichy criteria and indications for LT are used to diagnose ALF.
Formula	$\frac{\text{No. ALF patients to whom the LT criteria have been applied}}{\text{Total no. of ALF patients}} \times 100$
Explanation of the terminology	• LT criteria; King's College London and Clichy criteria (parameters defining at an early time which ALF patients would benefit from LT) • ALF: acute liver failure of different etiologies
Population	All patients with ALF during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • Mas A, Rodes J. Fulminant hepatic failure. Lancet. 1997 Apr 12; 349(9058):1081-5. • Riordan SM, Williams R.Use and validation of selection criteria for liver transplantation in acute liver failure. Liver Transpl. 2000 Mar; 6(2):170-3. • Bernuau J, Benhamou JP. Fulminant and subfulminant liver failure. Oxford University Press, 1999; 1341-7. • O'Grady JG, Alexander GJ, Hayllar KM, Williams R. Early indicators of prognosis in fulminant hepatic failure.Gastroenterology. 1989 Aug; 97(2):439-45. • Pauwels A, Mostefa-Kara N, Florent C, Levy VG. Emergency liver transplantation for acute liver failure. Evaluation of London and Clichy criteria.J Hepatol. 1993 Jan; 17(1):124-7.

Indicator number 83

Name of the indicator	MONITORIZATION OF POTENTIAL ORGAN DONORS
Dimension	Appropriateness
Justification	Organ donor management aims to obtain as many viable organs as possible and optimize their function. Therefore, a "maintenance protocol" is necessary in the ICU for multiple organ donors. The significant and frequent hemodynamic, metabolic, and thermoregulatory alterations inherent in this situation can endanger the viability of the organs to be transplanted at a later date.
Formula	No. of correctly monitored brain dead potential multiple organ donors ---------- x 100 Total no. of brain dead potential multiple organ donors
Explanation of the terminology	Brain death: clinical condition characterized by complete and irreversible cessation of encephalic functions, both of the brainstem and both cerebral hemispheres. Potential donor: brain dead patient without absolute contraindications for donation. Correct monitorization: minimal requirements: • invasive arterial pressure • central venous pressure • heart rate • central temperature • diuresis • blood gases • hemogram and coagulation • biochemical parameters: ionogram; glucose; hepatic, renal and systemic function tests; and urinary sediment
Population	All potential donors discharged from the ICU during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • Rosendale JD, Kauffman HM, McBride MA, Chabalewski FL, Zaroff JG, Garrity ER, Delmonico FL, Rosengard BR. Aggressive pharmacologic donor management results in more transplanted organs. Transplantation. 2003 Feb 27; 75(4):482-7. • Seller-Pérez G, Herrera-Gutiérrez ME, Lebrón-Gallardo M, Fernández-Ortega JF, Arias-Verdú D, Mora-Ordóñez J. Organ donation in the intensive care unit. [Article in Spanish]. Med Intensiva 2004; 28(6):308-315. • Wood KE, Becker BN, McCartney JG, D'Alessandro AM, Coursin DB.Care of the potential organ donor. N Engl J Med. 2004 Dec 23; 351(26):2730-9.

Indicator number 84

Name of the indicator	DIAGNOSIS OF BRAIN DEATH
Dimension	Effectiveness
Justification	Over 95% of the organs transplanted in Spain come from brain dead donors. These data confirm the importance of brain death (BD) for procuring organs for transplantation. Ample, correct clinical knowledge about the diagnosis of BD will undoubtedly contribute to an increase in the number of donors and therefore to the number of transplants.
Formula	$\frac{\text{Total no. of BD diagnosed}}{\text{Total no. of deaths in the ICU}} \times 100$
Explanation of the terminology	In Spain, approximately 14% of patients that die in ICUs are brain dead; this percentage could reach 30% in referral centers for neurosurgery. • Brain death: clinical condition characterized by complete and irreversible cessation of encephalic functions, both of the brainstem and both cerebral hemispheres. • The diagnosis can only be reached by means of clinical neurologic examination or instrumental diagnostic tests in accordance with the legislation in force (RD 2070/1999).
Population	All brain deaths diagnosed during the period reviewed.
Type	Outcome
Source of data	Clinical records and transplantation coordinator
Standard	5-30% Results < 5% represent a poor level of diagnosis
Commentaries	References: • Wijdicks EF.The diagnosis of brain death. N Engl J Med. 2001 Apr 19; 344(16):1215-21. • Report of the Quality Standards Subcommittee of the American Academy of Neurology. Practice parameters for determining brain death in adults (Summary statement). Neurology 1995; 45:1012-14. • Conclusiones de la III Conferencia de Consenso de la SEMICYUC. Muerte Encefálica en las Unidades de Cuidados Intensivos. Med Intensiva 2000; 24(4):193-197. • Spanish Royal Decree 2070/1999, of December 30, regulating obtainment and clinical use of human organs and territorial coordination in donated material and transplantation of organs and tissues. BOE 3/2000 de 04-01-2000, pág.179-190.

Indicator number 85

Name of the indicator	REMOVAL OF NASOGASTRIC TUBE (NGT) OCCASIONED BY OCCLUSION
Dimension	Risk
Justification	Failure to fulfill established guidelines for the administration of drugs and enteral alimentation via nasogastric tube (NGT) can cause it to become obstructed, with clinical consequences ranging from the risk of bronchoaspiration to the interruption of the prescribed treatment. All of this increases morbidity and costs.
Formula	$\frac{\text{No. of NGTs needing to be removed due to obstruction}}{\text{Total no. of NGTs removed}} \times 100$
Explanation of the terminology	Obstruction of the NGT: loss of patency of the NGT that requires its removal.
Population	All patients with NGT during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	4%
Commentaries	References: • Goñi Viguria R, Garcia Santolaya MP, Vazquez Calatayud M, Margall Coscojuela MA, Asiain Erro MC. Evaluation of care quality in the ICU through a computerized nursing care plan. [Article in Spanish]. Enferm Intensiva. 2004 Apr-Jun; 15(2):76-85. • Carrion MI, Ayuso D, Marcos M, Paz Robles M, de la Cal MA, Alia I, Esteban A. Accidental removal of endotracheal and nasogastric tubes and intravascular catheters. Crit Care Med. 2000 Jan; 28(1):63-6. • Moreno MA, Alvira F, Ballano MA, Simon C, Romea B, Luque P. Tolerance for enteral nutrition in critical patients. Results of a nursing protocol [Article in Spanish]. Enferm Intensiva. 1997 Apr-Jun; 8(2):82-6. • Marcos M, Ayuso D, Gonzalez B, Carrion MI, Robles P, Munoz F, de la Cal MA. Analysis of the accidental withdrawal of tubes, probes and catheters as a part of the program of quality control. [Article in Spanish]. Enferm Intensiva. 1994 Jul-Sep;5(3):115-20

Indicator number 86

Name of the indicator	APPROPRIATE BRONCHIAL ASPIRATION
Dimension	Risk
Justification	Using the proper technique in bronchial aspiration helps to reduce the incidence of mechanical-ventilation-associated pneumonia (MVP), reducing crossed contamination due to incorrect hand washing or the use of an unsterile technique when aspirating secretions. MVP is associated to increased mortality, augmenting the length of stay and thereby costs. Following the recommendations of the Centers for Disease Control (CDC) in Atlanta helps to reduce morbidity in bronchial aspiration.
Formula	No. of aspirations performed in accordance with CDC guidelines ---------- x 100 Total no. of aspirations of artificial airways
Explanation of the terminology	CDC recommendations: • Check to make sure that both the mouth and oropharynx are secretion-free. • Check to make sure there is adequate cuff pressure • Use a sterile technique (nurse with the help of a nurse's aide) • Use sterile materials and dispose of them afterward • Perform bronchial after respiratory physiotherapy and/or postural drainage Artificial airway: endotracheal tube and tracheostomy cannula
Population	All aspirations performed in patients with artificial airways during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: • CDC guidelines focus on prevention of nosocomial pneumonia. Am J Health Syst Pharm. 1997 May 1; 54(9):1022, 1025. • Lerga C, Zapata MA, Herce A, Martinez A, Margall MA, Asiain MC. Endotracheal suctioning of secretions: effects of instillation of normal serum. [Article in Spanish]. Enferm Intensiva. 1997 Jul-Sep; 8(3):129-37.

Indicator number 87

Name of the indicator	INFORMATION FROM NURSING STAFF TO PATIENTS' FAMILIES
Dimension	Satisfaction and appropriateness
Justification	Protocolized transmission of information from nursing staff to patients' families helps to reduce family members' anxiety and leads to greater family collaboration in the critical patients' health care process.
Formula	No. of families informed by nursing staff ---------- x 100 No. of patients discharged from the ICU
Explanation of the terminology	The information transmitted should include at least the following aspects: • information about the care provided for the patient by the nursing staff • information about the patient's emotional condition and comfort • emotional support for the families • families should be informed on a daily basis • appropriate physical space (office or bedside, depending on the patient's situation) • the provision of information should be documented in the clinical records Nursing staff should not provide information about prognostics, diagnostics, or treatment; this is the physicians' role.
Population	Families of all patients admitted to the ICU during the period reviewed. Exclusion criteria: • patients without families or similar relations • patients having formally expressed the desire that information be withheld from their families
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • Zaforteza Lallemand C, de Pedro Gomez JE, Gastaldo D, Lastra Cubel P, Sanchez-Cuenca Lopez P.What perspective do intensive care nurses have of their relationship with the relatives of a critical patient? [Article in Spanish]. Enferm Intensiva. 2003 Jul-Sep; 14(3):109-19. • Torrents Ros R, Oliva Torras E, Saucedo Fernandez MJ, Surroca Sales L, Jover Sancho C.Impact of the relatives of the critical patient. In light of a protocolized reception. [Article in Spanish]. Enferm Intensiva. 2003 Apr-Jun; 14(2):49-60. • Bernat Adell MD, Tejedor Lopez R, Sanchis Munoz J. How well do patients' relatives evaluate and understand information provided by the intensive care unit? [Article in Spanish]. Enferm Intensiva. 2000 Jan-Mar; 11(1):3-9. • Zazpe Oyarzun MC. Informing the families of patients admitted to an intensive care unit. [Article in Spanish]. Enferm Intensiva. 1996 Oct-Dec;7(4):147-51

Indicator number 88

Name of the indicator	INTRAHOSPITAL TRANSPORT
Dimension	Risk, effectiveness, and continuity of care
Justification	Intrahospital transport and movement of critical patients for diagnostic or therapeutic procedures increases the risk of complications by discontinuity in life-support and monitorization systems. Transport should be carried out using the right equipment and enough trained personnel to immediately resolve unforeseen problems that might threaten the patient's life. There should be a protocol for the material and personnel needed to prevent complications to minimize unforeseen events.
Formula	$\frac{\text{No. of assisted intrahospital transports with problems}}{\text{No. of assisted intrahospital transports}} \times 100$
Explanation of the terminology	Assisted transport: requiring • patients to be accompanied by qualified physicians and nurses • Continuous monitoring, ventilatory support, and continuous care Problems: appearance of any of the following situations during transport or movement, whether due to the patient or equipment: • patient falling • accidental withdrawal of catheters, tubes, airways, etc. • hemodynamic instability or respiratory insufficiency • hypothermia • equipment failure • desaturation due to disconnection or crimping of tubing
Population	All assisted intrahospital transports during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	15%
Commentaries	The bibliography varies widely in the rate of incidents reported (from 15.5% to 70%); therefore, we propose a standard on the lower limits. References: • Warren J, Fromm RE Jr, Orr RA, Rotello LC, Horst HM; American College of Critical Care Medicine. Guidelines for the inter- and intrahospital transport of critically ill patients. Crit Care Med. 2004 Jan; 32(1):256-62. • Lovell MA, Mudaliar MY, Klineberg PL. Intrahospital transport of critically ill patients: complications and difficulties.Anaesth Intensive Care. 2001 Aug; 29(4):400-5. • Waydhas C. Intrahospital transport of critically ill patients.Crit Care. 1999; 3(5):R83-9. • Martinez Magro ML, Lozano Quintana MJ, Lopez Castillo MT, Cuenca Solanas M. Intrahospital transportation of critical patients. [Article in Spanish]. Enferm Intensiva. 1995 Jul-Sep; 6(3):111-6 .

Indicator number 89

Name of the indicator	CUFF PRESSURE
Dimension	Risk
Justification	Excessively low endotracheal-tube or tracheostomy-tube cuff pressure does not permit efficacious mechanical ventilation, increases the risk of bronchoaspiration, accidental extubation, and displacement of the artificial airway. Excessively high cuff pressure is transmitted to the tracheal wall in contact and could cause ischemia, thereby increasing the risk of tracheobronchial lesions.
Formula	$\frac{\text{No. of cuff-pressure measurement controls within the recommended range}}{\text{Total number of cuff measurement controls}} \times 100$
Explanation of the terminology	• Within the recommended range: measurements falling between 17 and 22 mmHg or within the previously prescribed limits • Controls: measurements taken once every shift and whenever the endotracheal tube is moved
Population	All cuff-pressure controls performed in intubated critical patients during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	95%
Commentaries	References: • Granja C, Faraldo S, Laguna P, Gois L. Control of the endotracheal cuff balloon pressure as a method of preventing laryngotracheal lesions in critically ill intubated patients. [Article in Spanish]. Rev Esp Anestesiol Reanim. 2002 Mar;49(3):137-40 • Wilder NA, Orr J, Westenskow D. Clinical evaluation of tracheal pressure estimation from the endotracheal tube cuff pressure. J Clin Monit Comput. 1998 Jan; 14(1):29-34. • Fernandez R, Blanch L, Mancebo J, Bonsoms N, Artigas A. Endotracheal tube cuff pressure assessment: pitfalls of finger estimation and need for objective measurement.Crit Care Med. 1990 Dec; 18(12):1423-6.

Indicator number 90

Name of the indicator	MONITORING ALARMS MANAGEMENT
Dimension	Risk and effectiveness
Justification	Improper alarm management increases morbidity and mortality owing to delayed response. It also causes associated morbidity (arrhythmias and alterations of vital constants that might go unnoticed).
Formula	$\frac{\text{No. of patients monitored presenting an event due to improper alarms management}}{\text{No. of patients monitored}} \times 100$
Explanation of the terminology	Event: any undesired event occurring to a critical patient due to improper alarms management Improper alarms management: • Not specifically adapted for each patient • Canceled alarm • Unattended alarm
Population	All patients admitted to the ICU that are monitored during the period reviewed. Study period: daily sampling is recommended
Type	Outcome
Source of data	Clinical records. Nursing register of events.
Standard	5%
Commentaries	References: • Solsona JF, Altaba C, Maull E, Rodriguez L, Bosque C, Mulero A. Are auditory warnings in the intensive care unit properly adjusted?J Adv Nurs. 2001 Aug; 35(3):402-6. • Chambrin MC, Ravaux P, Calvelo-Aros D, Jaborska A, Chopin C, Boniface B. Multicentric study of monitoring alarms in the adult intensive care unit (ICU): a descriptive analysis. Intensive Care Med. 1999 Dec; 25(12):1360-6. • De Clercq PA, Blom JA, Hasman A, Korsten HH.A strategy for developing practice guidelines for the ICU using automated knowledge acquisition techniques. J Clin Monit Comput. 1999 Feb; 15(2):109-17.

Indicator number 91

Name of the indicator	ACCIDENTAL FALLS
Dimension	Risk and satisfaction
Justification	Patients can be injured in accidental falls. Falls also hurt perceived quality. Falls can be avoided. The use of safety protocols and restraining measures can reduce the incidence of falls.
Formula	$\frac{\text{No. of falls occurring}}{\text{No. of stays}} \times 100$
Explanation of the terminology	• All falls should be counted, whether the patient was in bed, sitting, or walking without the support necessary. Falls registered during movement/transport of patients should be included.
Population	All patients discharged from the ICU during the period reviewed.
Type	Outcome
Source of data	Clinical records. Specific register of falls.
Standard	0%
Commentaries	References: • Papaioannou A, Parkinson W, Cook R, Ferko N, Coker E, Adachi JD. Prediction of falls using a risk assessment tool in the acute care setting.BMC Med. 2004 Jan 21; 2:1. • Goñi Viguria R, Garcia Santolaya MP, Vazquez Calatayud M, Margall Coscojuela MA, Asiain Erro MC. Evaluation of care quality in the ICU through a computerized nursing care plan. [Article in Spanish]. Enferm Intensiva. 2004 Apr-Jun; 15(2):76-85. • Maccioli GA, Dorman T, Brown BR, Mazuski JE, McLean BA, Kuszaj JM, Rosenbaum SH, Frankel LR, Devlin JW, Govert JA, Smith B, Peruzzi WT; American College of Critical Care Medicine, Society of Critical Care Medicine. Clinical practice guidelines for the maintenance of patient physical safety in the intensive care unit: use of restraining therapies--American College of Critical Care Medicine Task Force 2001-2002. Crit Care Med. 2003 Nov; 31(11):2665-76.

Indicator number 92

Name of the indicator	NURSING REGISTERS IN THE ICU
Dimension	Continuity of care
Justification	Nursing registers form part of the patient's clinical records. They assure the quality and continuity of care. They help to avoid errors and repetition of procedures. They enable tasks to be planned and resources allocated. Furthermore, they are legal documents.
Formula	$\frac{\text{No. of duly completed registers}}{\text{No. of registers evaluated}} \times 100$
Explanation of the terminology	Nursing registers: charts where all pertinent inform about the patient from admission to discharge are registered, as well as all of the annexed documents accepted by the clinical documentation commission of the hospital. Duly completed: • with all data specified in the regulations for the use of the clinical records at each hospital • brief summary for each shift, duly signed by the nurse in charge of the patient
Population	All patients admitted to the ICU during the period reviewed.
Type	Outcome
Source of data	Clinical records.
Standard	100%
Commentaries	References: • Herrero Garcia T, Cabrero Cabrero AI, Burgos Martin MR, Garcia Iglesias M, Fernandez Herranz AI. Quality control of nursing records. [Article in Spanish]. Enferm Intensiva. 1998 Jan-Mar 9(1):10-5. • Martínez Riera JR. Informe de enfermería al ingreso (IEI). Instrumento específico de interrelación. Rev Rol Enferm 1999; 22:133-9. • García Martín N, Gutiérrez Palacios MP, Sanz Rosillo C, Varez González E. Registros de enfermería. Enferm Intensiva 1995; 6:14-9. • Lopez Coig ML, Perpina Galvan J, Cabrero Garcia J, Richart Martinez M.Classification of written nursing records in the intensive care unit of the Alicante General Hospital. [Article in Spanish]. Enferm Intensiva. 1995 Apr-Jun; 6(2):59-62.

Indicator number 93

Name of the indicator	MEDICATION ERRORS
Dimension	Risk
Justification	Errors in the administration of medication are not uncommon and are associated to increased morbidity, mortality, stays, and costs. Communicating these errors enables action to be taken to prevent them.
Formula	$\frac{\text{Total no. of errors in medication communicated}}{\text{Total number of administrations of medication}} \times 100$
Explanation of the terminology	• Total number of administrations: derived by calculating the mean number of patients in the ICU in one year and the mean number of administrations of medication per patient (approximately 15 administrations per day). • Errors in medication: discrepancy between the medication prescribed and its administration
Population	All patients admitted to the ICU during the period reviewed.
Type	Outcome
Source of data	Direct observation. "Medication errors" memorandum
Standard	5%
Commentaries	References: • Lacasa C, Humet C, Cot R. Errores de Medicación. Ed. EASO 2001. Programa de garantía de calidad en el Servicio de Farmacia del Hospital de Barcelona (II). Farm Hosp 1998; 22(6):271-278. • Holzmueller CG, Pronovost PJ, Dickman F, Thompson DA, Wu AW, Lubomski LH, Fahey M, Steinwachs DM, Engineer L, Jaffrey A, Morlock LL, Dorman T. Creating the web-based intensive care unit safety reporting system.J Am Med Inform Assoc. 2005 Mar-Apr;12(2):130-9.

Indicator number 94 (fundamental indicator)

Name of the indicator	COMPLIANCE WITH HAND-WASHING PROTOCOLS
Dimension	Risk and effectiveness
Justification	The hands are a mechanism of transmission of nosocomial infections; they are much more effective at this than aerosols or inanimate objects. Hand washing prevents cross-transmission of microorganisms. Improved compliance with hand-washing protocols before and after contact with patients can reduce nosocomial infection rates over 50% and diminishes the consumption of resources.
Formula	No. of hand washes indicated complying with the protocol ---------- x 100 No. of hand washes indicated
Explanation of the terminology	Hand washes complying with the protocol a) <u>hygienic wash</u>: Procedure: with water and neutral soap. Duration: 20 seconds Indicated: • before: starting the shift, going to eat, having contact with a patient, manipulating systems that should be sterile, preparing medication or food, performing procedures of short duration (<10 minutes). Whenever visibly dirty. • after: using the toilet, eating, touching material contaminated with secretions, touching a patient, end of the shift • before and after: contact with wounds and handling drainage systems • between: contact with different patients b) <u>antiseptic wash:</u> Procedure: with hydroalcholic solution. Duration: 2 minutes Indicated: before performing invasive procedures of long duration (20 minutes) and any maneuver involving immunodepressed patients.
Population	All ICU staff during the period reviewed (physicians, nurses, nurse's aides).
Type	Process
Source of data	Direct observation
Standard	90%
Commentaries	References: • Pittet D, Dharan S, Touveneau S, Sauvan V, Perneger TV.Arch Intern Med. 1999 Apr 26; 159(8):821-6. • Larson E, Kretzer EK. Compliance with handwashing and barrier precautions. J Hosp Infect. 1995 Jun; 30 Suppl: 88-106. • Pittet D, Hugonnet S, Harbarth S, Mourouga P, Sauvan V, Touveneau S, Perneger TV. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Infection Control Programme.Lancet. 2000 Oct 14; 356(9238):1307-12. • Guideline for Hand Hygiene in Healthcare Settings. CDC's Healthcare Infection Control Practices Advisory Committee (HICPAC), in collaboration with the Society for Healthcare. 2002. Available at www.cdc.gov/handhygiene

Indicator number 95

Name of the indicator	ACCIDENTAL REMOVAL OF INTRAVASCULAR CATHETERS
Dimension	Risk and effectiveness
Justification	Accidental removal of catheters implies increased risk of complications, increased workload, and consequently increased costs (material and human resources).
Formula	No. of intravascular catheters accidentally removed ---------- x 1000 days No. of days of intravascular catheters in place
Explanation of the terminology	Accidental removal includes: • removal by the patient • removal by staff in performing a maneuver • obstruction of the catheter Inclusion criteria: • Central venous or arterial catheter (central or peripheral insertion) • catheters inserted in the ICU or elsewhere Exclusion criteria: • patients admitted < 24 hrs
Population	All days of intravascular catheter in place in patients discharged after having spent at least 24 hrs in the ICU during the period reviewed.
Type	Outcome
Source of data	Clinical records
Standard	Arterial catheter: 20 catheters per 1000 days Central venous catheters: 6 catheters per 1000 days
Commentaries	References: • Carrion MI, Ayuso D, Marcos M, Paz Robles M, de la Cal MA, Alia I, Esteban A.Accidental removal of endotracheal and nasogastric tubes and intravascular catheters. Crit Care Med. 2000 Jan; 28(1):63-6. • Goñi Viguria R, Garcia Santolaya MP, Vazquez Calatayud M, Margall Coscojuela MA, Asiain Erro MC. Evaluation of care quality in the ICU through a computerized nursing care plan. [Article in Spanish]. Enferm Intensiva. 2004 Apr-Jun; 15(2):76-85. • Amo Priego MD, Carmona Monge FJ, Gomez Nieves I, Bonilla Zafra G, Gordo Vidal F.Assessment of the efficacy of the implementation of an arterial cannulation protocol as quality assurance method. [Article in Spanish]. Enferm Intensiva. 2004 Oct-Dec; 15(4):159-64.

Indicator number 96

Name of the indicator	REVISION OF CARDIAC ARREST CARTS
Dimension	Risk and appropriateness
Justification	The correct maintenance of cardiac arrest carts ensures that material is available when needed. This indicator measures the level of prevention for the potential response to an emergency.
Formula	No. of revisions performed according to protocol ---------- x 100 No. of revisions indicated (days x 2)
Explanation of the terminology	Revision according to protocol includes: • Time: twice a day (12 hr nursing shift) • Contents: 1. Check the cart's seal 2. If sealed, signature and date of revision 3. If not sealed, check list of medications, airways material, and circulatory support material 4. Check functioning of the monitor, defibrillator (according to the working instructions for each monitor in accordance with the manufacturer's instructions)
Population	All planned revisions of the cart (twice daily) during the period reviewed. Exclusion criterion: revision of the cart after having used it.
Type	Process
Source of data	Specific control sheet for the cardiac arrest cart
Standard	100%
Commentaries	References: • Requirement: fulfillment of regulation UNE 60601. Security requirements for electromedical devices (regulations of the Spanish Society of Electromedicine and Clinical Engineering, SEEIC) • Agency for Healthcare Research and Quality: http:// www.ahrq.gov • Joint Commission. International standards for hospital accreditation.2000.

Indicator number 97

Name of the indicator	APPROPRIATE END-OF-LIFE CARE
Dimension	Effectiveness and satisfaction
Justification	End-of-life care in the ICU often goes unnoticed. A significant percentage of patients die in the ICU after the decision to withhold or withdraw life support (WLS). End-of-life care practices vary widely. Protocols based on recommendations of the scientific societies can reduce variability and improve quality.
Formula	$\frac{\text{No. of WLS patients dying in the ICU in whom the protocol was applied}}{\text{No. of WLS patients dying in the ICU}} \times 100$
Explanation of the terminology	The minimum aspects to be included in the WLS protocol are: • justification • specific agents and symptoms • mechanical ventilation, dialysis, artificial nutrition and hydration • counseling and support for caring staff and families • communication process
Population	All WLS patients dying in the ICU during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	References: The measurement of this indicator requires the existence of a specific protocol for end-of-life care and its application in patients in whom life support is withdrawn or withheld. • Clarke EB, Curtis JR, Luce JM, Levy M, Danis M, Nelson J, Solomon MZ; Robert Wood Johnson Foundation Critical Care End-Of-Life Peer Workgroup Members. Quality indicators for end-of-life care in the intensive care unit.Crit Care Med. 2003 Sep; 31(9):2255-62. • Truog RD, Cist AF, Brackett SE, Burns JP, Curley MA, Danis M, DeVita MA, Rosenbaum SH, Rothenberg DM, Sprung CL, Webb SA, Wlody GS, Hurford WE. Recommendations for end-of-life care in the intensive care unit: The Ethics Committee of the Society of Critical Care Medicine.Crit Care Med. 2001 Dec; 29(12):2332-48.

Indicator number 98 (fundamental indicator)

Name of the indicator	INFORMATION TO PATIENTS' FAMILIES IN THE ICU
Dimension	Satisfaction
Justification	Patients' rights to information are regulated by current legislation. A significant percentage of critical patients are incapacitated, which means that this information must be given to family members or other persons to whom the patient has a close relation. In critical patients, given the severity and variability in the clinical situation, this information should fulfill a set of criteria.
Formula	$\frac{\text{No. of families informed according to the criteria}}{\text{No. of patients admitted to the ICU}} \times 100$
Explanation of the terminology	Families: immediate family members or those authorized by the patient. Criteria for information to families: • Daily (including weekends and holidays); ample time should be taken to explain the most important changes occurring and to respond to the families queries. • In a comfortable place, ensuring privacy • Given by the physician in charge of the patient, i.e. the physician attending the patient or supervising the patient's diagnosis and treatment. When the physician in charge of the patient is absent, the physician on duty will assume this role.
Population	Families of all patients admitted to the ICU during the period reviewed. Exclusion criteria: • patients without families or similar relations • patients having formally expressed the desire that information be withheld from their families
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	• Compliance with the indicator requires fulfilling the three criteria cited in the "Explanation of the terminology" section. • Ideally, information should be delivered in an office. • Information will always be provided on admission. References: Spanish law 41/2002 regulating patients' autonomy and rights, and obligations regarding information and clinical documentation (November 2002). BOE 15 November 2002.

Indicator number 99

Name of the indicator	INCORPORATION OF ADVANCE HEALTH DIRECTIVES IN THE DECISION-MAKING PROCESS
Dimension	Appropriateness and satisfaction
Justification	Advance health directives (AHD) facilitate respect for the incapacitated patient's wishes. Current legislation establishes and regulates the obligation to incorporate AHD into the decision-making process. It is the physicians' responsibility to explore the existence of AHD in the decision-making process for those patients that cannot express their preferences.
Formula	$\frac{\text{No. of incapacitated patients for whom the existence of AHD was explored}}{\text{No. of incapacitated patients}} \times 100$
Explanation of the terminology	Incapacitated patient: patient unable to make decisions due to his/her condition. Advance health directives: involves the exploration of AHD that fulfill the requirements for legal validity. Other types of prior instructions that are not legally regulated should also be taken into consideration (oral, written documents, etc.)
Population	All incompetent patients in the ICU during the period reviewed.
Type	Process
Source of data	Clinical records: should include an explicit statement by the attending physician about whether the existence of AHD has been explored before making decisions regarding incapacitated patients.
Standard	100%
Commentaries	References: • Spanish law 41/2002 regulating patients' autonomy and rights, and obligations regarding information and clinical documentation (November 2002). BOE 15 November 2002. • Saralegui Reta I, Monzón Marín JL, Martín MC. Instrucciones previas en Medicina Intensiva. Med Intensiva 2004; 28:256-261.

Indicator number 100

Name of the indicator	INFORMED WRITTEN CONSENT (IWC)
Dimension	Satisfaction
Justification	In general, every act in a healthcare environment requires the patient's prior consent or, in the case of incapacitated patients, that of their legal representative. Failure to obtain consent violates the patient's right to autonomy. Although, as a general rule, consent will be verbal, the legislation requires written consent in certain circumstances (surgery, invasive procedures and those that suppose significant risks or drawbacks).
Formula	$\frac{\text{No. of IWC correctly obtained}}{\text{No. of procedures requiring IWC performed}} \times 100$
Explanation of the terminology	IWC correctly obtained: document including the identification and signature of the patient and physician, a brief description of the procedure and the potential risks involved, as well as other alternatives if they exist. Procedures requiring IWC: • Tracheostomy • Non-emergency transfusion of blood derivatives • Surgical intervention • Dialysis techniques • Non-emergency pacemaker implantation • Plasmapheresis • Angiography
Population	All of the above-mentioned procedures performed during the period reviewed.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	All of the requisites listed in the "explanation of the terminology" section must be met for this indicator to be considered fulfilled. References: • Spanish law 41/2002 regulating patients' autonomy and rights, and obligations regarding information and clinical documentation (November 2002). BOE 15 November 2002. • Solsona JF, Cabré L, Abizanda R, Campos JM, Sainz A, Martín MC, Sánchez JM, Bouza C, Quintana M, Saralegui I, Monzón JL and the Bioethics Group of the SEMICYUC. Recomendaciones del grupo de bioética de la SEMICYUC sobre el Consentimiento Informado en UCI. Med Intensiva 2002; 26(5):254-255.

Indicator number 101 (fundamental indicator)

Name of the indicator	WITHHOLDING AND WITHDRAWING LIFE SUPPORT (WLS)
Dimension	Appropriateness and satisfaction
Justification	The aim of WLS is to avoid suffering caused by futile treatment. WLS is applied in a significant percentage of critical care patients. The decision to forego life support should never be taken individually, rather certain essential criteria, both scientific and consensual, must be met.
Formula	$\frac{\text{No. of WLS indications meeting the criteria}}{\text{Total number of WLS indications}} \times 100$
Explanation of the terminology	Both withdrawing and withholding therapeutic measures are considered WLS. Essential criteria for the indication: • based on evidenced-based medicine • consideration of the patient's wishes, as well as advance health directives • consensus among the healthcare team • families must be informed and consulted All of the above must be stated in the clinical records (the decision to apply WLS, its clinical basis, whether reached by consensus, family informed, and whether the patient's previous instructions were taken into consideration).
Population	All patients admitted to the ICU to whom WLS is applied during the period reviewed. Exclusion criteria: • Decision not to admit the patient to the ICU, as this cannot generally be preceded by the team's deliberation. • In the case of therapeutic futility, the healthcare team can apply WLS without consulting the family.
Type	Process
Source of data	Clinical records
Standard	100%
Commentaries	In cases of discrepancy with the family, it is recommendable to consult the institution's Ethics Committee. References: • Cabré L, Solsona JF and the Bioethics Work group of the SEMICYUC. Limitación del esfuerzo terapéutico en Medicina Intensiva. Medicina Intensiva 2002; 26:304-311. • Esteban A, Gordo F, Solsona JF, Alia I, Caballero J, Bouza C, Alcala-Zamora J, Cook DJ, Sanchez JM, Abizanda R, Miro G, Fernandez Del Cabo MJ, de Miguel E, Santos JA, Balerdi B.Withdrawing and withholding life support in the intensive care unit: a Spanish prospective multi-centre observational study.Intensive Care Med. 2001 Nov;27(11):1744-49.

Indicator number 102

Name of the indicator	USE OF RESTRAINTS
Dimension	Risk and appropriateness
Justification	Restraints (physical and/or medications) are often used in the ICU for the patient's own safety or to protect healthcare equipment. Given the ethical connotations involved (use in incapacitated patients, impossibility of family approval, possibility for abuse by caretakers, etc.) and the potential undesirable consequences from the clinical point of view, the use of restraints should be protocolized.
Formula	No. of applications of restraints according to protocol ---------- x 100 No. of applications of restraints
Explanation of the terminology	Restraints can be physical and/or pharmacological. The use of restraints should only be prescribed by a physician. The protocol should include, at least: • a definition of restraint and types • indications for situations in which restraints should be applied • follow-up of restrained patients Exclusion criteria: therapeutic measures to immobilize patients (tractions) and restraints imposed by court order.
Population	All applications of restraints during the period reviewed.
Type	Process
Source of data	Clinical records (restraining orders should be recorded in both the clinical records and nursing register).
Standard	100%
Commentaries	The measurement of this indicator implies the existence of a specific protocol for the indication and management of restraints. References: • Maccioli GA, Dorman T, Brown BR, Mazuski JE, McLean BA, Kuszaj JM, Rosenbaum SH, Frankel LR, Devlin JW, Govert JA, Smith B, Peruzzi WT; American College of Critical Care Medicine, Society of Critical Care Medicine.Clinical practice guidelines for the maintenance of patient physical safety in the intensive care unit: use of restraining therapies--American College of Critical Care Medicine Task Force 2001-2002.Crit Care Med. 2003 Nov;31(11):2665-76.

Indicator number 103

Name of the indicator	THE EXISTENCE OF A MEDICAL EMERGENCY TEAM (MET)
Dimension	Appropriateness and efficiency
Justification	The existence of a hospital or critical department MET has been shown to be efficacious in reducing unscheduled admissions to the ICU, in lowering the number of cases of cardiac arrest, in reducing hospital mortality, and in improving efficiency in reducing hospital stays.
Formula	Yes or no
Explanation of the terminology	Medical emergency team (MET): team of physicians and nurses available 24hrs/day to respond to calls from healthcare personnel outside the ICU when certain objective criteria of life-threatening situations arise in a patient.
Population	Critical care department.
Type	Structure
Source of data	MET procedural manual in the critical care department
Standard	Yes (100%)
Commentaries	References: • Scales DC, Abrahamson S, Brunet F, Fowler R, Costello J, Granton JT, McCarthy MK, Sibbald WJ, Slutsky AS. The ICU outreach team. J Crit Care. 2003 Jun; 18(2):95-106. • Hillman KM, Bristow PJ, Chey T, Daffurn K, Jacques T, Norman SL, Bishop GF, Simmons G. Duration of life-threatening antecedents prior to intensive care admission. Intensive Care Med. 2002 Nov; 28(11):1629-34. • Parr M. In-hospital resuscitation: review and revise.Resuscitation. 2001 Jul;50(1):13-4 • Bellomo R, Goldsmith D, Uchino S, Buckmaster J, Hart GK, Opdam H, Silvester W, Doolan L, Gutteridge G. A prospective before-and-after trial of a medical emergency team.Med J Aust. 2003 Sep 15;179(6):283-7.

Indicator number 104

Name of the indicator	SUSPENSION OF SCHEDULED SURGERY
Dimension	Efficiency
Justification	The suspension of scheduled surgical interventions (SI) due to unavailability of ICU beds can involve a risk to the patient, diminish satisfaction, and increase stays and costs. Aunque influyen diferentes factores, la falta deplanificación de alta/ingresos en el SMI favorece este evento
Formula	$\frac{\text{No. of scheduled SI suspended due to unavailability of previously reserved ICU beds}}{\text{No. of SI with previously reserved ICU beds}} \times 100$
Explanation of the terminology	Scheduled SI suspended due to unavailability of ICU bed: SI not performed on the day scheduled because the bed reserved in the ICU was not available.
Population	All scheduled SI with a previously reserved ICU bed during the period reviewed. Exclusion criteria: patients with scheduled SI with previously reserved ICU beds that are directly admitted to a hospital ward other than the ICU because critical care is deemed unnecessary.
Type	Outcome
Source of data	ICU management register Surgical registers
Standard	10%
Commentaries	References: • Pronovost PJ, Berenholtz SM, Ngo K, McDowell M, Holzmueller C, Haraden C, Resar R, Rainey T, Nolan T, Dorman T.Developing and pilot testing quality indicators in the intensive care unit. J Crit Care. 2003 Sep; 18(3):145-55. • Williams T, Leslie G. Delayed discharges from an adult intensive care unit. Aust Health Rev. 2004 Sep 30; 28(1):87-96.

Indicator number 105 (fundamental indicator)

Name of the indicator	PERCEIVED QUALITY SURVEY AT DISCHARGE FROM THE ICU
Dimension	Satisfaction
Justification	Patient-centered care is one of the main goals of healthcare. Satisfaction surveys are one of the most frequently employed methods to determine patients' and families' perceived quality and to establish measures to improve results.
Formula	$\frac{\text{No. of surveys answered}}{\text{No. of patients discharged from the ICU}} \times 100$
Explanation of the terminology	Discharge includes: transfer to hospital ward or another institution, discharge to home, or death. Readmissions should be counted. Answered survey: survey returned with > 70% of the items answered.
Population	All patients discharged from the ICU during the period reviewed.
Type	Process
Source of data	Nursing register
Standard	80%
Commentaries	The satisfaction survey should include items regarding: 1. Environmental conditions; 2. Relations with physicians; 3. Relations with nursing staff; 4. Aspects related to visits. References: • Pérez MD, Rodríguez M, Fernández A, Catalán M, Montejo JC. Evaluation of satisfaction among the relatives of patients admitted to an intensive care unit. [Article in Spanish]. Med Intensiva 2004; 28(5):237-49. • Wasser T, Pasquale MA, Matchett SC, Bryan Y, Pasquale M.Establishing reliability and validity of the critical care family satisfaction survey.Crit Care Med. 2001 Jan;29(1):192-6.. • Dodek PM, Heyland DK, Rocker GM, Cook DJ. Translating family satisfaction data into quality improvement.Crit Care Med. 2004 Sep; 32(9):1922-7. • Heyland DK, Rocker GM, Dodek PM, Kutsogiannis DJ, Konopad E, Cook DJ, Peters S, Tranmer JE, O'Callaghan CJ. Family satisfaction with care in the intensive care unit: results of a multiple center study.Crit Care Med. 2002 Jul; 30(7):1413-8.

Indicator number 106

Name of the indicator	INAPPROPRIATE OR PRECIPITATED DISCHARGE FROM THE ICU
Dimension	Risk and appropriateness
Justification	The limited number of beds in the ICU and the increase in the number of critical patients favor the tendency of some patients being discharged in inappropriate or precipitated circumstances. Precipitated or inappropriate discharge is associated to increased readmission, stays, costs, and hospital mortality.
Formula	$\frac{\text{No. of patients with precipitated or inappropriate discharge from the ICU}}{\text{No. of patients discharged from the ICU}} \times 100$
Explanation of the terminology	Precipitated or inappropriate discharge: • patients with unscheduled discharge: not based on consensus reached in a clinical session or forced discharge to allow another patient to be admitted (during the night, weekends or holidays) • patients discharged without fulfilling standardized criteria
Population	All patients discharged from the ICU during the period reviewed. Exclusion criterion: orders to withhold life support
Type	Process
Source of data	Clinical records.
Standard	1%
Commentaries	References: • Goldfrad C, Rowan K. Consequences of discharges from intensive care at night. Lancet. 2000 Apr 1; 355(9210):1138-42. • Daly K, Beale R, Chang RW.Reduction in mortality after inappropriate early discharge from intensive care unit: logistic regression triage model. BMJ. 2001 May 26; 322(7297):1274-6. • (1) Guidelines for ICU admission discharge and triage. Critical Care Medicine 1999; 27:633-638.

Indicator number 107

Name of the indicator	CODIFICATION OF INFORMATION AT DISCHARGES FROM THE ICU
Dimension	Effectiveness
Justification	Standardized classification of the main diagnosis, secondary diagnoses, and procedures at discharge from the ICU is an essential tool for the management and improvement of quality. It also prevents the loss of information.
Formula	$\frac{\text{No. of patients discharged from the ICU that have been classified}}{\text{No. of patients discharged from the ICU}} \times 100$
Explanation of the terminology	Classified: Use of a standardized system of classification (e.g. ICD-9-CM*) or specific list for codification of the primary and secondary diagnoses as well as procedures.
Population	All patients discharged from the ICU during the period reviewed.
Type	Process
Source of data	Clinical Documentation Department.
Standard	100%
Commentaries	References: • (*) ICD-9-CM. The International Classification of Disease 9th Revision. Clinical Modification. • Raya A, Alvarez E, Torres JM, Rodríguez M, Mérida A, Hinojosa R; Vázquez G. Clasificación y codificación de enfermedades y técnicas en medicina intensiva. Med Intensiva 1987; 11(2):20-27. • Barrientos Vega R. Nuestra experiencia con los grupos relacionados por el diagnóstico en una unidad de cuidados intensivos. Med Intensiva 2003; 27:391-398.

Indicator number 108

Name of the indicator	DELAYED DISCHARGE FROM THE ICU
Dimension	Efficiency, accessibility, and appropriateness
Justification	Delays in the discharge of critical patients are associated with inappropriate increases in cost and reduce the number of beds available for new admissions. Delays could increase morbidity and hamper relations with patients' families. Appropriate management of ICU beds and prior scheduling of discharges reduces delays at discharge.
Formula	No. of stays with delays at discharge from the ICU ---------- x 100 Total no. of stays
Explanation of the terminology	Delay at discharge: > 24 hrs from indication for discharge to exit from ICU
Population	All ICU stays of patients discharged from the ICU during the period reviewed. Exclusion criteria: • stays of patients discharged to other centers • stays of patients in whom a previously planned discharge was delayed for medical reasons
Type	Outcome
Source of data	Clinical records
Standard	9%
Commentaries	References: • Pronovost PJ, Berenholtz SM, Ngo K, McDowell M, Holzmueller C, Haraden C, Resar R, Rainey T, Nolan T, Dorman T.Developing and pilot testing quality indicators in the intensive care unit. J Crit Care. 2003 Sep; 18(3):145-55. • Williams T, Leslie G. Delayed discharges from an adult intensive care unit. Aust Health Rev. 2004 Sep 30; 28(1):87-96. • Levin PD, Worner TM, Sviri S, Goodman SV, Weiss YG, Einav S, Weissman C, Sprung CL. Intensive care outflow limitation--frequency, etiology, and impact. J Crit Care. 2003 Dec; 18(4):206-11.

Indicator number 109

Name of the indicator	DELAYED ADMISSION TO THE ICU
Dimension	Accessibility, efficiency, and risk
Justification	Delays in admission of critical patients to the ICU are associated with increased morbidity and mortality, as well as increased cost. Delays are usually related to the unavailability of ICU beds.
Formula	$\frac{\text{No. of critical patients admitted to the ICU after delays > 4 hrs}}{\text{Total no. of patients discharged from the ICU}} \times 100$
Explanation of the terminology	Delay: time interval from indication for admission by ICU physician to actual admission to the ICU
Population	All patients discharged from the ICU during the period reviewed. Exclusion criterion: • patients transferred from other centers
Type	Outcome
Source of data	Clinical records
Standard	5%
Commentaries	In cases of delayed admission, the critical care physician is still responsible for care of the critical patient (wherever the patient is located). References: • Sprung CL, Geber D, Eidelman LA, Baras M, Pizov R, Nimrod A, Oppenheim A, Epstein L, Cotev S. Evaluation of triage decisions for intensive care admission. Crit Care Med. 1999 Jun; 27(6):1073-9. • Pronovost PJ, Berenholtz SM, Ngo K, McDowell M, Holzmueller C, Haraden C, Resar R, Rainey T, Nolan T, Dorman T.Developing and pilot testing quality indicators in the intensive care unit. J Crit Care. 2003 Sep; 18(3):145-55. • Goldhill DR, McNarry AF. Physiological abnormalities in early warning scores are related to mortality in adult inpatients. Br J Anaesth. 2004 Jun; 92(6):882-4.

Indicator number 110

Name of the indicator	STANDARDIZED MORTALITY RATE (SMR)
Dimension	Risk, effectiveness, and efficiency
Justification	Raw mortality is not a good indicator of quality as it does not take into consideration differences in case mix or severity of illness. The use of SMR enables comparative auditing.
Formula	$\frac{\text{Observed hospital mortality}}{\text{Expected hospital mortality (mean value +/ confidence interval)}} \times 100$
Explanation of the terminology	• Observed hospital mortality: no. of patients admitted to the ICU that die in the hospital/no. of patients admitted to the ICU per unit of time • Expected hospital mortality: arithmetic sum of the individual probabilities of death for each patient admitted to the ICU according to the severity score/no. of patients admitted to the ICU • Standardized mortality: mortality adjusted for severity; different predictive models can be used (APACHE I-II-III, MPM I-II, SAPS I-II) • This indicator is based on the comparison of the results with those predicted by the model. • All predictive indices of risk of death refer to hospital mortality.
Population	All patients admitted to the ICU during the period reviewed. Exclusion criteria: • patients dying within 24 hrs of admission to the ICU • post-cardiac-surgery patients (because no validated system is available for this type of patient)
Type	Outcome
Source of data	Clinical records; mortality commission
Standard	Rate = 1 (+/- 0.10)
Commentaries	The main selection criteria should be the exactitude (validation and reliability) of the model and the goodness of fit (calibration and discrimination). References: • Abizanda R, Marsé P, Valle FX, Jordá R, López J.Consideraciones sobre la medida del nivel de gravedad en pacientes críticos. Su aplicación a un programa de calidad. Control de Calidad Asistencial 1991; 6:56-60. • Gordo F, Nunez A, Calvo E, Algora A. Intrahospital mortality after discharge from the ICU (hidden mortality) in patients who required mechanical ventilation [Article in Spanish]. Med Clin (Barc). 2003 Sep 6; 121(7):241-4.

Indicator number 111

Name of the indicator	AUTOPSY RATE
Dimension	Effectiveness
Justification	Clinical-pathological correlation is important. Knowledge acquired from autopsies is useful for scientific training necessary in future situations similar to the death investigated.
Formula	No. of patients autopsied ---------- x 100 No. of patients dying in the ICU
Explanation of the terminology	
Population	All patients dying in the ICU during the period reviewed. Exclusion criterion: • cases in which autopsied is performed to comply with court order.
Type	Process
Source of data	Clinical records; pathology department
Standard	10%
Commentaries	References: • The autopsy rate in ICU patients reported in different studies ranges from 25-50% http://remi.uninet.edu/2004/01REMIA011.htm • Esteban A, Alia I, Fernández P, Palomino R. Evolución del porcentaje de autopsias en una Unidad de Cuidados Intensivos. Med Intensiva 1991; 15:127-130. • An autopsy rate > 10% of all patient deaths is considered desirable for accreditation of critical care departments as training centers. National Commission on the Specialty of Intensive Medicine. Med Intensiva 1997; 21:392-39.

Indicator number 112

Name of the indicator	STAFF ORIENTATION PLAN (SOP) IN THE ICU
Dimension	Appropriateness
Justification	New professionals integrated into the ICU, whether on a long-term or short-term basis, whether working for the center or merely at the center, will perform better if they are familiar with the organization of the ICU from their first day in the unit.
Formula	$\frac{\text{No. of professionals assigned to the ICU having gone through the SOP}}{\text{No. of professionals assigned to the ICU}} \times 100$
Explanation of the terminology	• Professional assigned to the ICU: Any professional assigned to the ICU, whether working for the center or merely at the center (physician, nurse, nurse's aide, orderlies, and administrative staff), whether on a temporary or permanent basis. • SOP: Written plan explicitly explaining the organization of the department, its mission, its values and philosophy, its principal goals, staff members and their roles and responsibilities.
Population	All professionals assigned to the ICU in the last year.
Type	Process
Source of data	Hospital Human Resources Department
Standard	100%
Commentaries	The SOP will also cover the mission, values, and philosophy of the critical care department.

Indicator number 113 (fundamental indicator)

Name of the indicator	PRESENCE OF AN INTENSIVIST IN THE ICU 24 HRS/DAY
Dimension	Appropriateness, risk, and efficiency
Justification	The presence of an intensivist in the ICU 24 hrs/day guarantees the quality of care, decreasing mortality and stay among critical patients.
Formula	$\frac{\text{No. of days without the physical presence of an intensivist 24 hrs/day}}{365} \times 100$
Explanation of the terminology	• Intensivist: physician that is a certified intensive medicine specialist, excluding specialists in training. • Physical presence is considered necessary.
Population	All days of the year during the period reviewed.
Type	Structure
Source of data	Human Resources Department and Duty Rosters
Standard	0%
Commentaries	References: • Pronovost PJ, Angus DC, Dorman T, Robinson KA, Dremsizov TT, Young TL.Physician staffing patterns and clinical outcomes in critically ill patients: a systematic review.JAMA. 2002 Nov 6; 288(17):2151-62. • Vincent JL. Need for intensivists in intensive-care units.Lancet. 2000 Aug 26; 356(9231):695-6.

Indicator number 114 (fundamental indicator)

Name of the indicator	ADVERSE EVENTS REGISTER
Dimension	Risk
Justification	Adverse events are common in the field of medicine and are related to significant mortality, morbidity, as well as increased stays and costs. Moreover, they diminish patients' and families' satisfaction. Monitoring adverse events related to intensive medicine is essential in improving the quality of care and for the development of systems for prevention.
Formula	No. of patients with a complete register of adverse events ---------- x 100 No. of patients reviewed
Explanation of the terminology	Complete adverse events register: discharge register (in the clinical records or specific sheet) of the principal adverse effects occurring. It is considered essential to register: • Nosocomial infection (MV-associated pneumonia, catheter-associated bacteremia, urinary catheter-associated infection) • Pneumothorax due to puncture • Decubitus ulcer • Medication errors/adverse reactions to medications • Accidental extubation Patients reviewed: random selection of patients (*)
Population	All patients discharged from the ICU in the last year (sampling days).
Type	Process
Source of data	Clinical records; Adverse events register
Standard	100%
Commentaries	'ulfillment of this indicator is facilitated by a system for registering adverse events. *) The authors recommend measuring this indicator by prospectively selecting sampling ays and verifying the occurrence of any of the above-mentioned adverse events. References: • Zhan C, Miller MR. Excess length of stay, charges, and mortality attributable to medical injuries during hospitalization.JAMA. 2003 Oct 8; 290(14):1868-74. • Needham DM, Thompson DA, Holzmueller CG, Dorman T, Lubomski LH, Wu AW, Morlock LL, Pronovost PJ.A system factors analysis of airway events from the Intensive Care Unit Safety Reporting System (ICUSRS).Crit Care Med. 2004 Nov;32(11):2227-33.. • Holzmueller CG, Pronovost PJ, Dickman F, Thompson DA, Wu AW, Lubomski LH, Fahey M, Steinwachs DM, Engineer L, Jaffrey A, Morlock LL, Dorman T. Creating the web-based intensive care unit safety reporting system.J Am Med Inform Assoc. 2005 Mar-Apr;12(2):130-9 • ESICM-HSRO available at www.esicm.org

Indicator number 115

Name of the indicator	UNSCHEDULED READMISSION TO THE ICU
Dimension	Risk and efficiency
Justification	A high rate of readmission could reflect premature discharges, incorrect use of ward care, or a poor response to treatment despite appropriate care. Low rates could reflect excessively long ICU stays (inappropriate discharge criteria). Readmission is generally associated with increased hospital stays, increased consumption of resources, and greater morbidity and mortality.
Formula	$\frac{\text{No. of patients with unscheduled readmissions < 48 hrs.}}{\text{No. of patients discharged from the ICU}} \times 100$
Explanation of the terminology	Unscheduled readmission: Readmission due to unforeseen causes; whether related or not and regardless of where the patient spent the last 48 hrs.
Population	All patients discharged from the ICU during the period reviewed. Exclusion criteria: • Death • Discharges with orders to withhold life support (readmission)
Type	Outcome
Source of data	Admissions Department; ICU
Standard	4%
Commentaries	The readmission rate reported in the different studies publishes ranges from 4-14% (mean 7%). References: The Society of Critical Care Medicine's Quality Indicators Committee ranked ICU readmission within 48hrs as the top indicator for judging ICU quality. • Angus DC.Grappling with intensive care unit quality--does the readmission rate tell us anything? Crit Care Med. 1998 Nov; 26(11):1779-80. • Recommendations for intensive care unit admission and discharge criteria. Task Force on Guidelines. Society of Critical Care Medicine.Crit Care Med. 1988 Aug; 16(8):807-8. • Metnitz PG, Fieux F, Jordan B, Lang T, Moreno R, Le Gall JR. Critically ill patients readmitted to intensive care units--lessons to learn? Intensive Care Med. 2003 Feb; 29(2):241-8. • Rosenberg AL, Watts C. Patients readmitted to ICUs*: a systematic review of risk factors and outcomes.Chest. 2000 Aug; 118(2):492-502.

Indicator number 116

Name of the indicator	ACCESS TO RELEVANT MEDICAL SOURCES IN ELECTRONIC FORMAT
Dimension	Appropriateness
Justification	A large part of the relevant medical information is concentrated in a relatively small number of databases. On-line access to these electronic sources of information helps achieve more efficient use of the time dedicated to searching for scientific information and improves the quality of the data obtained, promoting decision making based on up-to-date scientific evidence. Likewise, this resource facilitates interaction with other colleagues and hospitals, giving access to important clinical information about patients.
Formula	Existence or not of on-line access
Explanation of the terminology	Availability of continuous on-line access (24 hrs.) to electronic sources of scientific information.
Population	Not applicable
Type	Structure
Source of data	ICU
Standard	100%
Commentaries	• The variability of clinical practice, the complexity of ICU decisions, and the availability of current IT systems, justify this indicator in and of themselves.

Indicator number 117

Name of the indicator	EXISTENCE OF BASIC PROTOCOLS
Dimension	Appropriateness
Justification	Good clinical practice is favored by the standardization of processes in agreement with current scientific evidence by means of periodically updated protocols. Protocols should adjust guidelines to the diagnostic and therapeutic possibilities of our working environments. Protocols should aim to homogenize the urgent treatment provided at each center and serve as a tool to facilitate and streamline decision making.
Formula	Existence of duly updated basic protocols
Explanation of the terminology	Protocol: should include evaluation, diagnosis, treatment, and healthcare circuits used, at the least. Basic protocols: the entire ICU should have protocols for: • Criteria for admission and discharge • Acute coronary syndrome (ACS) • Management of severe arrhythmias and heart block • Traumatic brain injury • Sedation and pain management • Invasive and noninvasive mechanical ventilation and weaning • Severe sepsis and treatment of infections in general • Withholding and withdrawing life support • Appropriate end-of-life care • Use of restraints • Enteral and parenteral nutrition • Dialysis • Brain death • Acute respiratory distress syndrome (ARDS) • Life support • Prophylaxis against upper-gastrointestinal bleeding • Prophylaxis against deep-vein thrombosis Updating: referring to the period of time established for revision. In general, a period of 3 to 5 yrs. is recommended.
Population	Census of updated protocols in the ICU.
Type	Structure
Source of data	Register of protocols
Standard	100%
Commentaries	The standard should only be considered met when all 17 protocols listed above are available and when these meet the criteria for content and updating. Protocols for pathologies that do not pertain to services provided by the critical care department should be excluded from the list of basic protocols. The authors recommend that, in addition to these processes, protocols should be made available for all clinical situations in which normal medical practice varies.

Indicator number 118

Name of the indicator	RESEARCH ACTIVITY
Dimension	Appropriateness
Justification	Participation of professionals and/or departments in research activities and/or grants can be an indicator of the scientific level of the department.
Formula	No. of research projects and grants per year.
Explanation of the terminology	Research project: an investigative study that is approved by the corresponding committee at the hospital. "Post-authorization" studies promoted by the industry are excluded (this refers to phase IV clinical trials, carried out on medications after commercialization). Spanish Royal decree 561/1993 about requisites for clinical trials. Grants can be awarded to individual professionals or to the department. Only those awarded by independent external sources should be considered in the formula.
Population	Record of grants and projects carried out in the department. Projects and grants lasting longer than one year should only be counted in the first year.
Type	Process
Source of data	Department's annual activity report
Standard	1 grant or research project per year
Commentaries	The authors consider this indicator to be highly recommendable for teaching hospitals and fundamental for accreditation for training residents.

Indicator number 119

Name of the indicator	SCIENTIFIC PUBLICATIONS
Dimension	Appropriateness
Justification	Research activity can be rewarding and is virtually an extension of our duty as healthcare professionals. The research performed in our units should be measured. When done properly, research should yield benefits for the quality of care and of the department as a whole. One standardized way of measuring research activity is through publication in scientific journals.
Formula	No. of publications per year involving members of the department.
Explanation of the terminology	Publications: written communications about a subject in medicine or life sciences submitted to a biomedical journal according to the guidelines established by the International Committee of Medical Journal Editors (N Engl J Med 1997; 336:309-315).
Population	All publications in indexed journals in which the department has participated in a natural year.
Type	Outcome
Source of data	Hospital's or department's annual activity report
Standard	2 publications in national journals or 1 in an international journal / year
Commentaries	The authors consider this indicator to be highly recommendable for teaching hospitals and fundamental for accreditation for training residents.

Indicator number 120

Name of the indicator	CONTINUING MEDICAL EDUCATION (CME)
Dimension	Appropriateness
Justification	Participation and/or attendance at congresses, conferences, seminars, and workshops in other places or institutions is of interest as an opportunity to acquire knowledge, to see alternative ways of working, and to create ties between professionals and institutions, all of which improves the overall quality of the department.
Formula	No. of CME credits/year/person.
Explanation of the terminology	CME: duly accredited training activity taking place outside the department.
Population	Healthcare staff (physicians and nurses). Temporary staff should be excluded from the formula.
Type	Process
Source of data	Department's annual training activity report
Standard	3 credits / person / year
Commentaries	Promotional congresses and activities organized by the pharmaceutical industry that are not accredited should be excluded.

6. SUMMARY TABLE

NUMBER	INDICATOR NAME	STANDARD
CARDIAC CARE AND CPR		
1.	**Early administration of acetylsalicylic acid in acute coronary syndrome**	**100%**
2.	Early administration of beta-blockers in acute myocardial infarction	100%
3.	Cardiac catheterization in high-risk non-ST-elevation myocardial infarction	95%
4.	Risk stratification in non-ST-elevation myocardial infarction	100%
5.	Door-needle time in ST-elevation myocardial infarction	100%
6.	**Early reperfusion techniques in ST-elevation myocardial infarction**	**100%**
7.	Hospital mortality in ST-elevation myocardial infarction	12%
8.	Early treatment of cardiovascular dysfunction	95%
9.	Therapeutic hypothermia after cardiac arrest	90%
10.	Use of the Utstein template	100%
11.	Perioperative myocardial infarction in heart surgery	10%
12.	Incidence of early complications in the implantation of permanent pacemakers	2%
ACUTE RESPIRATORY INSUFFICIENCY		
13.	Incidence of barotrauma	5%
14.	Ventilator circuit change at 7 days	> 90%
15.	Serious complications during prone position in acute respiratory distress syndrome (ARDS)	< 2%
16.	Spontaneous breathing trial	55%
17.	Selective decontamination of digestive tract in patients at risk	80%
18.	Limited alveolar pressure (P plateau) in invasive mechanical ventilation	10%
19.	Limited maximum inspiratory pressure (P peak) in invasive mechanical ventilation	10%
20.	**Semirecumbent position in patients undergoing invasive mechanical ventilation**	**97%**
21.	Changing heat-and-moisture exchangers	100%
22.	**Prevention of thromboembolism**	**90%**
23.	Unplanned extubation	15 episodes / 1000 days intubation
24.	Reintubation	12%
25.	Early implementation of noninvasive mechanical ventilation on worsening of chronic obstructive pulmonary disease (COPD)	95%
26.	Low tidal volume during invasive mechanical ventilation in acute lung injury	95%

NUMBER	INDICATOR NAME	STANDARD
	NEURO-INTENSIVE CARE AND TRAUMATOLOGY	
27.	Examination of potentially severe trauma (PST) patients by intensivists	95%
28.	Tracheal intubation within 8 hrs in patients with severe traumatic brain injury and Glasgow coma score < 9	95%
29.	**Surgical intervention in traumatic brain injury with subdural and/or epidural hematoma**	**100%**
30.	Use of corticosteroids in traumatic brain injury	0%
31.	Incidence of acute respiratory distress syndrome (ARDS) in severe trauma	10%
32.	**Monitorization of intracranial pressure in severe traumatic brain injury with pathologic CT findings**	95%
33.	Mortality in severe traumatic brain injury	50%
34.	Early osteosynthesis in fractures of the femoral diaphysis	95%
35.	Early surgical fixation of open fractures	95%
36.	Early cerebral arteriography in subarachnoid hemorrhage	90%
37.	Administration of nimodipine in subarachnoid hemorrhage	100%
38.	Polyneuropathy in critical patients	< 50%
39.	Immediate CT examination in ischemic stroke	90%
40.	Intravenous fibrinolysis in acute ischemic stroke	100%
41.	Use of somatosensory evoked potentials in post-anoxic encephalopathy	90%
	INFECTIOUS DISEASES	
42.	Bacteremia related to central venous catheter (CVC)	4 episodes / 1000 days CVC
43.	Urinary tract infection related to urethral catheter (UC)	6 episodes / 1000 days UC
44.	**Pneumonia associated to mechanical ventilation (MV)**	**18 episodes / 1000 days MV**
45.	**Early management of severe sepsis / septic shock**	**95%**
46.	Inappropriate empirical antibiotic treatment for infections treated in the ICU	10%
47.	Methicillin-resistant ***staphylococcus aureus*** infections	0.04%
48.	Indications for isolation	100%
49.	Administration of corticosteroids in septic shock	95%
50.	Early initiation of antibiotic therapy in severe sepsis	100%

NUMBER	INDICATOR NAME	STANDARD
METABOLISM AND NUTRITION		
51.	Complications of total parenteral: hyperglycemia/ liver dysfunction	hyperglycemia: 25% liver dysfunction < 10%
52.	Maintaining appropriate levels of glycemia	80%
53.	Severe hypoglycemia	0.5%
54.	Identification of nutritional risk	100%
55.	Assessment of nutritional status	100%
56.	**Early enteral nutrition**	**100%**
57.	Monitorization of enteral nutrition	100%
58.	Calorie and protein requirements	80%
59.	**Prophylaxis against gastrointestinal hemorrhage in patients undergoing invasive mechanical ventilation**	**95%**
NEPHROLOGY		
60.	Indications for continuous dialysis	80-90%
61.	Dopamine use in acute renal failure	0%
62.	Incidence of acute renal failure in non-coronary critical patients	10%
63.	Incidence of acute renal failure in coronary patients	5%
64.	Prevention of contrast-induced nephropathy in coronariography	90%
65.	Assessment of acute renal failure in critical patients	100%
SEDATION AND ANALGESIA		
66.	Monitorization of sedation	95%
67.	**Appropriate sedation**	**85%**
68.	Daily interruption of sedation	80%
69.	**Pain management in unsedated patients**	**100%**
70.	Pain management in ventilated patients	100%
71.	Inappropriate use of muscle relaxants	2%
72.	Monitorization of neuromuscular blockage	100%
73.	Identification of delirium	90%
BLOOD COMPONENTS		
74.	Informed consent for transfusion of blood components	95%
75.	Inappropriate transfusion of fresh-frozen plasma	0%
76.	Inappropriate transfusion of platelet –rich plasma	0%
77.	**Inappropriate transfusion of packed red blood cells**	**5%**

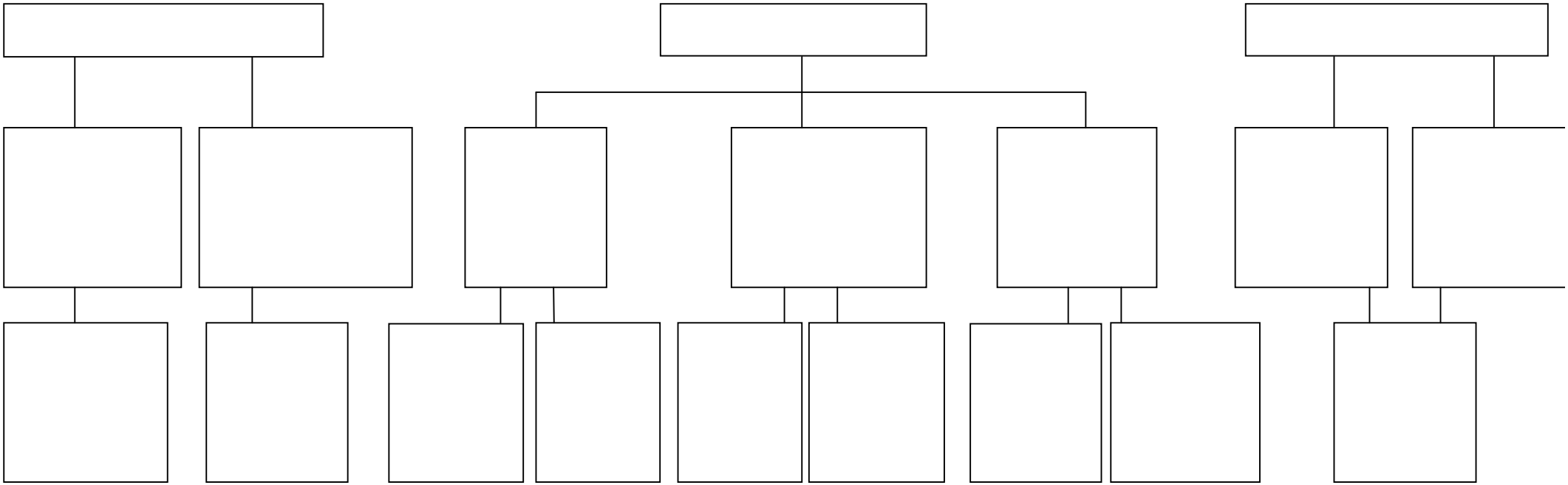
NUMBER	INDICATOR NAME	STANDARD
TOXICOLOGY		
78.	Appropriate digestive decontamination in intoxications by ingestion	95%
79.	Minimum antidote requirements	95%
80.	Early hemodialysis in acute intoxication	90%
TRANSPLANTATION		
81.	**Organ donors**	**60%**
82.	Evaluation of liver transplantation in acute liver failure	95%
83.	Monitorization of potential organ donors	100%
84.	Diagnosis of brain death	5-30%
NURSING		
85.	Removal of nasogastric tube occasioned by occlusion	4%
86.	Appropriate bronchial aspiration	100%
87.	Information from nursing staff to patients' families	95%
88.	Intrahospital transport	15%
89.	Cuff pressure	95%
90.	Monitoring alarms management	5%
91.	Accidental falls	0%
92.	Nursing registers in the ICU	100%
93.	Medication errors	5%
94.	**Compliance with hand-washing protocols**	**90%**
95.	Accidental removal of intravascular catheters	Art. catheter: 20/1000 days CVC: 6/1000 days
96.	Revision of cardiac arrest carts	100%
BIOETHICS		
97.	Appropriate end-of-life care	100%
98.	**Information to patients' families in the ICU**	**100%**
99.	Incorporation of advance health directives in the decision-making process	100%
100.	Informed written consent	100%
101.	**Withholding and withdrawing life support**	**100%**
102.	Use of restraints	100%
PLANNING, ORGANIZATION, AND MANAGEMENT		
103.	The existence of a medical emergency team	100%
104.	Suspension of scheduled surgery	10%
105.	**Perceived quality survey at discharge from the ICU**	**80%**
106.	Inappropriate or precipitated discharge from the ICU	1%

NUMBER	INDICATOR NAME	STANDARD
107.	Codification of information at discharges from the ICU	100%
108.	Delayed discharge from the ICU	9%
109.	Delayed admission to the ICU	5%
110.	Standardized mortality rate	Rate: 1(+/- 0.10)
111.	Autopsy rate	10%
112.	Staff orientation plan in the ICU	100%
113.	**Presence of an intensivist in the ICU 24 hrs/day**	**0%**
114.	**Adverse events register**	**100%**
115.	Unscheduled readmission to the ICU	4%
INTERNET		
116.	Access to relevant medical sources in electronic format	100%
CONTINUING EDUCATION, TRAINING, AND RESEARCH		
117.	Existence of basic protocols	100%
118.	Research activity	1 grant/ year
119.	Scientific publications	2 publications/year
120.	Continuing medical education	3 credits/ year

Indicators considered fundamental are shown in **bold type**.

7. APPENDICES

TOXIC DOSE, INDETERMINATE OR UNKNOWN DRUG



(1) The dose of activated carbon in adults is 25-50 g (oral). Via nasogastric tube in cases of lapse of consciousness disorders, difficulty in swallowing, or patient refusal. In potentially severe intoxications, a second dose (25 g) can be administered at 60 min. In case of vomiting, wait 30 minutes and re-administer. In severe intoxications with substances with delayed release, phenobarbital, carbamazepine, theophylline, quinine, and dapsone: new dose (25 g) every 3 hrs while clinical severity persists, in this situation sodium sulfate (oral): one dose (30 g).
(2) Iron, lithium and potassium. Also alcohols, glycols, hydrocarbons, petroleum and derivatives, heavy metals, arsenic, cesium, alkalines, inorganic acids, bromine, iodine.
(3) The initial dose of ipecacuanha in adults is 30 ml. If vomiting does not occur within 20 mins, a second and final dose (30 ml) can be administered.
(4) With long-chain polyethylene glycol: in adults 20 grams in 250 ml every 15 mins during 2-3 hrs, orally or via nasogastric tube.
(5) With Glasgow Coma Scale ≤ 9, or loss of pharyngeal reflex; due to the risk of bronchoaspiration, protection of the airway by orotracheal intubation is obligatory before starting gastric lavage.
(6) In cases of patients with prior convulsions or intoxication by the following substances entails a significant risk of convulsions: isoniazid, antimalarial drugs, theophylline.
(7) In cases of ingestion of multiple intoxicating substances or ingestion at different intervals, the option most beneficial to the patient must be chosen.
(8) The ingestion of potentially lethal doses ALWAYS necessitates digestive decontamination in the first few hours.
(9) Tricyclic antidepressants include tricyclic and tetracyclic drugs (maprotiline, mianserin, etc).
Taken from: Lloret J, Nogue, S, Jiménez X, Protcols, Codis d'Activació i Cicuits d'atenció urgent a Barcelona Ciutat. Malalt amb intoxicacions agudes greus. Consorci Sanitari de Barcelona. Barcelona 2004

Annex to indicator 79. Antidotes recommended according to hospital type

Primary Care Center (*)	Non-hospital Emergency Clinic
• Atropine • Biperiden • Activated carbon • Dexchlorpheniramine • Diazepam • Flumazenil • Glucagon (**) • Hypertonic glucose • Oral haloperidol • Naloxone • Normobaric oxygen • IV Vitamin K • Ipecacuanha syrup	• Folinic acid • Adrenaline • Apomorphine • IV 1M Sodium bicarbonate • Corticosteroids • Diphenhydramine • Dopamine • IV Ethanol absolute • Phenytoin • Calcium gluconate • IV / intramuscular Haloperidol • Hydroxocobalamine • Insulin • Noradrenaline • Pyridoxine • Protamine • Magnesium sulfate • Thiamine And all of the aforementioned

Level I Hospital	Level II Hospital	Level III Hospital
• N-acetylcysteine • Dobutamine • Phenobarbital • Phytomenadione • Gabapentin • Heparin • Isoproterenol • Neostigmine • Fresh plasma • Long-chain polyethylene glycol And all of the aforementioned	• Ascorbic acid • Methylene blue • Bromocriptine • Dantrolene • Desmopressin • Phentolamine • Physostigmine • Glucagon • Nicotinamide • Oximes • Penicillin • Procainamide • Chelating agents (1) • Silibinin • Sodium thiosulfate And all of the aforementioned	• Thioctic acid • Digoxin antidote (2) • Prussian blue (3) • Prothrombin complex • Fomepizol • Mucopolysaccharidase • Octreotide • Hyperbaric oxygen(4) • Antiophidic serum (5) • Antibotulinum (3) And all of the aforementioned

(*) Consider possible variations according to the characteristics of the geographical area
(**) In hypoglycemia not responding to hypertonic glucose, as a second choice
(1) BAL, desferroxamin, EDTA, DMSA, penicillinamine, etc.
(2) In toxicological reference centers
(3) Not always available
(4) In specialized centers
(5) In specific centers

Taken from: Lloret J, Nogue, S, Jiménez X, Protcols, Codis d'Activació i Cicuits d'atenció urgent a Barcelona Ciutat. Malalt amb intoxicacions agudes greus. Consorci Sanitari de Barcelona. Barcelona 2004