

Quality assessment in Intensive Care Medicine

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Abstract

The main indications for computerized tomography (CT) guided percutaneous procedures are reviewed and some of the techniques involved are described.

The authors also analyze the main applications of CT guided diagnostic and therapeutic procedures of specific organs and

sites, some of which are illustrated with iconography from our hospital. The diagnostic sensitivity and specificity are looked at, as well as the therapeutic outcome of this approach.

Key words: computerized tomography, international radiology, guided biopsies.

Today, the Intensive Care Unit (ICU) is one of the central departments of the hospital. The ability to monitor critically ill patients, together with the possibility of substituting, at least temporarily, the function of failing organs have contributed to the increasing role of the ICU in the treatment of patients in acute conditions. But this evolution has a price. The ICU accounts for approximately 20% of hospital costs, while treating only about 5% of patients. This statistic raises major concerns regarding its correct usage.¹ In an increasingly competitive world, the ICU is constantly faced with the need to review its practices whilst demonstrating its usefulness. Evaluation and quality improvement are both important parts of this process. Are we capable of evaluating and improving the quality of our practices in order to better serve those who depend on us?

A general concern with this issue led the European Intensive Care Society to set up a working group dedicated to continuous quality improvement in the ICU. In this context, general recommendations for quality improvement in the ICU were recently published.²

However, the lack of consensus over the terminology makes it difficult to tackle this issue. The objective of this review is to analyze the definitions that exist, and evaluate their applicability within the context of intensive care.

Healthcare Quality

The American Medical Association defined high-quality care, in 1984, as care which “consistently contributes to the maintenance or improvement of the quality and/or duration of life”.³ Six years later, the US Institute of Medicine took this concept further by defining healthcare quality as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge”.⁴ This definition is still valid and frequently used. In 1990, Jonathan Lomas defined quality assurance as “the measurement of health care activity, in order to identify whether the expected objectives are being achieved and when this is not the case, to respond with effective action and reduce deviation from the objectives”.⁵

Today both health professionals and society in general are increasingly concerned with the quality of medical practice. Examples such as the New York State Department of Health’s recent publication of statistics on the performance of cardiac surgeons⁶ indicate the extent to which society is willing to evaluate and control the quality of services provided to it. Doctors, along with other healthcare service providers, are therefore faced with increasing pressure to assess and revise their practices. This issue is aggravated by the explosion of available scientific information in recent years. Defining the best diagnostic and therapeutic approaches is becoming more and more

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difficult, and it is practically impossible for a doctor to keep up-to-date with all the new developments in his or her area of specialization, at least in a field as vast and multidisciplinary as Intensive Care Medicine. Fortunately, the advent of clinical epidemiology, information warehousing systems and the emergence of new methods of data analysis and summarization are able to provide doctors with important and timely information about the best options available.⁷⁻⁹

Quality Assessment

It is now generally agreed that all quality evaluation and improvement methods in critical care should focus, as in any other business, on three targets: structures, processes and results (*Table 1*).¹⁰

From the point of view of structures, ICUs are extremely heterogeneous. A recent study to evaluate the importance of non-clinical factors in ICU performance¹¹ demonstrated the existence of enormous variations between ICUs within the same country, and even more so between ICUs in different countries. Differences in the characteristics of patients admitted to the ICU in terms of severity, diagnoses and coexisting pathologies, are natural causes for some of these differences. It is important to emphasize, however, that the differences persist even after controlling these patient-related factors; differences in the construction of the ICUs, in their positions within the hospitals' organization charts, in how they are managed and in terms the number and training of the professionals who work in them, all contribute to the existence of these dissimilarities.

Processes represent the second major aspect of this problem. The treatment of critically ill patients is only possible through the coordination of numerous processes, both clinical and non-clinical. Traditionally, health professionals have always been more concerned with the clinical side: how to diagnose a ventilator-associated pneumonia, how to prescribe a vasoactive agent, how to ventilate a patient with an acute lung injury, when and how to dialyze a patient with acute renal failure. Today this perspective is changing. The recent demonstration of how factors like the culture of the ICU or the characteristics of its organization contribute significantly to its performance¹¹ is gaining the attention and interest of professionals involved in this aspect of healthcare. It has yet to be proven, however, that changing antiquated practices and structures leads to an improvement in

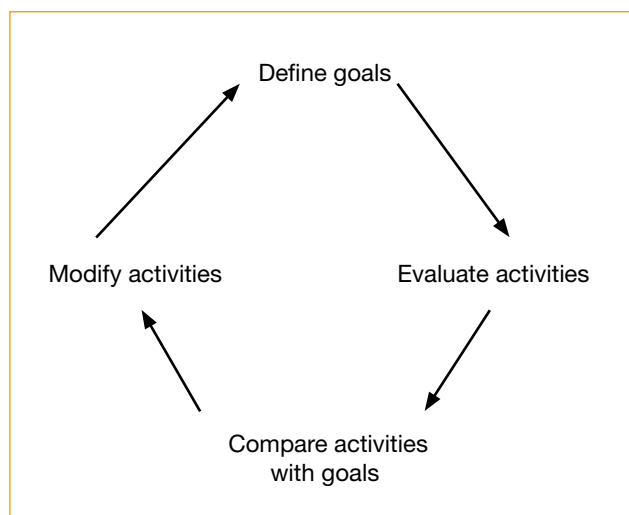


FIG. 1

processes, and in the final analysis, in the results.

The assessment of the processes involved in the treatment of the critically ill patient is complicated by the three-dimensional nature of the ICU.¹² Firstly, the ICU has a set of processes and activities, largely dependent upon its own characteristics. Secondly, it is integrated (whether formally or informally) within a department to which it is joined. Finally, its activity is trans-departmental by nature, with patients being transferred to and from various locations, and a need to frequently move patients for diagnostic and therapeutic procedures.

Results are one of the fields to which more attention has been paid. In the final analysis, they are the most important criterion for the evaluation of the first two components. Today there is a consensus that for quality criteria based on the structure or process to be credible, it must have been previously shown that variations in the attribute measured led to differences in the results. However, being generally less sensitive, they should only be used when it is possible to show that changes to structures or processes do lead to modified results, given that poor outcomes do not always occur as a result of process errors.¹³

Quality attributes

Regardless of whether our attention is focused on structure, process or results, the evaluation of system quality has several attributes in common. In 1990, Avedis Donabedian proposed seven quality-defining attributes for health systems:¹⁴ efficacy, effectiveness,

TABLE I
Goals of intensive care evaluation and improvement processes

Structures:	characteristics of the units and the professionals that work in them
Processes:	components of contacts between health professionals and patients
Outcomes:	state of health after the delivery of healthcare

efficiency, optimality, acceptability, legitimacy and equity (Table 2). Are these both appropriate and applicable to intensive care?

Efficacy and effectiveness

An assessment of the efficacy of intensive care, or of any of its components, is not currently part of the evaluation practice. By definition, efficacy is the capacity of a health system to improve the outcome of interest when applied under optimum conditions. This implies that the evaluation can only be conducted within an experimental or quasi-experimental context.

This concept is applied to the evaluation of some components of our business, for example in the development of new drugs. Its application to technological procedures is also an important component in the assessment of new technologies, and must always be completed before widespread use. Recent examples show us that it is very difficult, even impossible, to conduct evaluations later. The application of this concept to other components of care, such as management practices, has been difficult due to a lack of models and appropriate measurement techniques.

Effectiveness can be defined as the capacity of a health system to improve the outcome of interest when applied under routine circumstances. Its evaluation in purely scientific terms, even today, is an almost impossible task. In accordance with the methodological criteria used in other fields of science, the assessment should be based on randomized double-blind studies, comparing the effectiveness of the care provided in the ICU with the care provided in other hospital units.¹⁶ However, the widespread belief that critical care treatment is correctly prescribed in the majority of cases raises ethical opposition to conducting these types of studies. Other approaches, such as

TABLE II
Quality-defining attributes of Health Systems

Efficacy:	capacity of a health system to improve the outcome of interest when applied under optimal circumstances
Effectiveness:	capacity of a health system to improve the outcome of interest when applied under routine circumstances
Efficiency:	measure of cost required to achieve any improvement in a health system
Optimality:	peak of the relationship between healthcare benefits and their costs
Acceptability:	adaptation of healthcare to the desires, expectations and values of patients and their families
Legitimacy:	acceptability of healthcare by the community and society
Equity:	degree of fairness in the allocation of healthcare and its benefits to the members of a population
Adapted from Donabedian ¹⁴	

the use of historical controls, have been used: some point out the usefulness of intensive care,¹⁷⁻¹⁹ others do not.²⁰⁻²² These studies, however, can be criticized on methodological terms with regard to the comparability of the groups.

The task remains of comparing the effectiveness of intensive care at the individual ICU level. In other words, measuring the absolute effectiveness of the ICU is replaced by measuring its relative effectiveness. The question to be answered is whether the results obtained for an ICU conform to the expectations. Using this approach, the results observed in the population analyzed are compared with those of a reference population, controlled for basic patient characteristics using prognostic models like APACHE II²³ or SAPS II.²⁴ The reference population can be chosen either as a gold standard, if the predictive model used was based on exceptional ICUs, or as an average if the model was based on a random sampling of ICUs.²⁵

This approach to the comparison of observed with expected outcomes is not new; it has been used in the comparison of hospital mortality rates, using the difference between the mortality rate observed

and that predicted by a model, controlling for some patient attributes.²⁶⁻²⁷ As regards intensive care, some researchers have proposed the use of a standardized mortality ratio as an indicator of relative effectiveness. The assumption is that while ICUs might admit heterogeneous patient groups with significant differences in the attributes that influence outcomes, such as age, prior state of health or diagnosis, existing models can be used as a control for most of such attributes.²⁸

Is this the most appropriate methodology? Firstly, its use requires that the outcome of interest be relevant, clearly defined, and able to be accurately measured. Secondly, the model must be controllable for important basic patient characteristics related to the outcome of interest. A complete understanding of the predictive models, especially of their methodological limitations, is most important for all those who want to use them for the process of quality control in the ICU.²⁹ It should also be stressed that the outcomes chosen for measurement will change, with an increasing tendency towards quality of life versus mortality rate.³⁰

We should keep in mind that these measurements are only a small part of the quality improvement process. The implementation of a quality improvement program is an extensive process, as shown in Figure 1: the definition of clear goals, the evaluation of activities, the comparison of activities with goals, the modification of activities (if the goals have not been achieved) and the definition of new goals. To date, most research has been focused on only a small part of the process: the measurement of activities and their comparison against objectives. This process, which is no more than quality assessment, is important, but does not guarantee quality improvement. On the other hand, especially in relation to the ICU, there are many doubts concerning our ability to control other variables that may influence the results.

Two issues remain to be solved. The first is the definition of goals, the second is the assessment of techniques to measure our activities and compare them against our goals. Additionally, the ability to modify our activities, efficiently and in a timely fashion, in order to achieve the goals, must be demonstrated.

The goals must be clearly defined, realistic, established prior to the measurement of activities, and always defined with the participation and under the leadership of the professionals involved;³¹ otherwise, later on, when the process later suggests that there

are failures in the activity, doubts will inevitably arise concerning the validity of the goals defined.³² Some authors⁵ have argued that only goals directly related to healthcare results should be chosen. From this perspective, other outcomes (technical capability, accessibility, for example) should only be used as secondary goals, given that the primary goal of healthcare providers is to improve the health of the population. This opinion is not shared by all.

How can this process be applied? We shall demonstrate with an example: to improve the quality of haemodynamic monitoring we can try to reduce our rate of complications from 4% (a frequently cited number) to 2% within a year. This goal must be discussed with, and accepted by all professionals involved, and concrete proposals must be outlined to reach this target number. The next step is to measure our rate of complications at the end of the year, and compare them against the proposed goal, adjusting for possible differences in population makeup. Let's suppose that at the end of the year our rate of complications improved (let's say to 3%). Given that this figure number does not meet the goals, a specific analysis of the processes involved needs to be conducted, followed by the implementation of protocols, recommendations, or other means of modifying our activity. The cycle should then restart.

Efficiency and optimality

Efficiency is nothing more than the measurement of the cost required achieving any health system improvement. Efficiency assessment of an ICU or of any of its sub-processes (for example, the use of prophylactic antibiotics) involves two distinct steps: a demonstration that the activity is associated with improved results, and the measurement of the costs required to achieve the improvement. These two processes, which together comprise a cost/benefit analysis, are increasingly important and must be included in the evaluation of any new process or technology. One particular, but very important, aspect of this issue when applied within the context of intensive care is the evaluation of the appropriateness of the use of intensive care.

In the last few years, much research has been conducted around the appropriate use of intensive care, and two main problems have been identified. The first is the use of the ICU to monitor low-risk patients who could be treated in other units of the hospital, and the

second is the use of intensive care for terminally ill patients. We shall discuss these problems separately.

Recent research has demonstrated, beyond doubt, that ICUs are under-utilized. Recently published findings describe capacity usage values as low as 76%, dropping to 49% in some parts of Europe.^{33, 34} Various researchers³⁵⁻³⁹ have tried to find methods to identify and characterize these low-risk patients who receive only basic care and monitoring during their ICU stays, and who could (and should) have been discharged earlier to less intensive hospital units.^{40,41} It could be argued that these patients have a low probability of requiring active life support, and a low risk of death because they were treated in an ICU. In other words, treating them in less intensive hospital units could lead to more frequent deterioration of their clinical conditions, with a resulting increase in morbidity and death.⁴² In addition, the cost of intensive care depends mainly on the amount of nursing care required by the patient. The patient's characteristics (for example, the diagnosis and the degree of physiological dysfunction) are not the only factors that determine consumption; it also depends on the policies and practices in force in each ICU. It follows that it is probably more important to focus on admission, treatment and discharge procedures than on the development of a prognostic model for identification. Only in this way can we develop appropriate guidelines and recommendations.

The second problem is the limitation of treatment for patients who are no longer able to benefit from it. This approach has been advocated⁴³ but in the majority of cases, these patients can not be identified at the time of admission, given that the degree of physical dysfunction, although variable, is not usually very high.⁴⁴⁻⁴⁶ This seriously limits the impact of most systems that have been advocated to determine this.⁴⁷ Several recent studies have shown that in some cases, delivering prognostic information to the attending physician is beneficial,⁴⁸ but it is too early to be certain that this is always the case. In any event, efforts should be made to limit cases where maintaining life support is unacceptable, expensive, and many times inhumane for both the patients and their families.

The concept of optimality is closely related to the concept of efficiency. Optimality is the point at which the balance between benefits and costs is maximized. It is very important whenever we try to relate healthcare benefits to their costs. Certainly, we

do not have enough knowledge about the point at which the balance between the costs and benefits of the ICU reaches a maximum. This implies, then, that the potential costs and benefits must be assessed and discussed with all interested parties. And in this field, the views of the community as a whole, not just the intensive care professionals, are important.

Acceptability, legitimacy and equity

Regardless of the absolute cost of healthcare, it must be adapted to the wishes of patients and their families. Within this context, there are other important dimensions beyond the subjective evaluation made by the patient and the effectiveness and the efficiency of the care provided to him, such as the characteristics of the doctor-patient relationship, the accessibility to the doctor, and the patient's comfort of the patient. Acceptability in a broad sense is thus intimately tied to the degree of patient satisfaction.

When transposed from patient to society as a whole, this concept evolves into legitimacy: to what extent is the care provided acceptable to the community and to society? Conflicts of interest may arise around this point, regarding what is better for the patient versus what is better for society. A recent example is the mandatory reporting of infecto-contagious diseases such as tuberculosis. Mandatory reporting, while sometimes necessary for the protection of other members of society (think, for example, of a cook with bacilli tuberculosis), can result in compulsory dismissal of an individual from the workplace. Still, society must have an egalitarian concern. In a world where resources are limited and optimum care cannot be provided to all elements of society, it is necessary to maintain a degree of justice in the distribution of this care. It is therefore necessary to consider and evaluate alternatives.

In the past, in drawing attention to the issue of quality assessment, there were those who argued that the three fundamental pillars of medical care quality were efficacy, effectiveness and efficiency.⁴⁹ This position, although correct, is incomplete because it focuses more on the doctor than on the patient. It comes from an era when the doctor was responsible for both the definition and appraisal of the care he provided. Today, at least in Western societies, society demands a say on this issue. And, from this point of view, concepts like optimality, acceptability, legitimacy and fairness are equally fundamental.

Final note

We live in a world of changing mindsets and finite resources. Patients expect intensive care professionals to explain the effects of care and how they can be obtained. They expect their opinions to be taken into consideration, and to be able to choose between available options. The community, meanwhile, expects the options to be acceptable and that a certain degree of fairness is maintained in their distribution.

Intensive care professionals, as an interested party to this discussion, must be prepared to address and discuss these subjects with all the parties involved. As Hippocrates said in his Aphorisms, "The physician must not only be prepared to do what is right himself, but also to make the patient, the attendants, and externals cooperate". This is what, in the past, we did only partially and what society expects of us.

It is no longer possible to define a single measurement, without error, for quality in the provision of healthcare. We must address the problem on various levels, focusing sequentially or simultaneously on structures, processes and results. This approach demands both continuous attention and appropriate preparation on the part of health professionals. It was said, many years ago, that Medicine is part art and part science. Until now quality assessment and improvement have been made up of 90% art and 10% science. It is time to change. ■

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