Research Article

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The CUSUM model, a security tool

Summary

Introduction

The Cusum method allows the student is evaluated personalized way. It requires software where alpha and beta errors and acceptable failure rate (h0) or unacceptable (h1) are set. When the participant is within the limits of decision h0 and h1 is within the learning curve and just across the decision limit h0, it can be considered that it has acquired efficiency in performing this procedure (competition).

Objective

Make a reflection on the objective and personalized assessment method, called CUSUM, or cumulative sums, to evaluate the acquisition of psychomotor skills in a lab, and later skills when activities are performed in patients, which it is intended to provide greater security to patients.

Methodology

From a non-systematic review of the medical literature on the Cusum, a reflection highlighting the usefulness of this method of assessment on the acquisition of psychomotor skills in medicine arises.

Conclusion

Evaluation is a difficult task, more medicine, where despite the aphorism "To err is human", an error malpractice can endanger the patient's life. The Cusum method emerges as an objective assessment tool for the acquisition of procedural knowledge and skills and deserves its implementation in the health professions.

Keywords: learning curves, cusum, competition, clinical impact

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Introduction

This learning model, despite being known in the world for several decades, has only recently been implemented in Colombia from the education department of the Colombian Society of Anesthesiology and Resuscitation SCARE and from the Faculty of Medicine of the National University of Colombia. It allows you to evaluate sequentially ("Accumulated Sum") if the participant or student has acquired the learning efficiently (it is under control) or if, on the contrary, he needs more support and analysis of why he has not achieved it (it is out of control).

Where does the Cusum come from?

The history of this statistical tool was born in Germany, with the application of mathematics in the service of engineering and quality control in the war industry.[1,2] As a statistical method, through trend analysis, it provides a rapid evaluation of performance.[3] Medicine has been using it, since 1977, as a method for evaluating and evaluating psychomotor skills, since it allows high vigilance, greater support and autonomy for the participant, and objectivity in evaluation.[4]

### What differentiating factor does it have?

The difference between this learning method with respect to the progressive delegation (regressive supervision) that is done in the clinical procedures, or the percentage learning curves (that are carried out to a population of participants), is that the Cusum model is a custom method. Take into account the chances of failure with type 1 error (alpha or false positives) and type 2 error (beta or false negatives), and a list of steps according to Lex artis (medical evidence). The tolerance of these 2 types of statistical errors in education is 10%; they are attributed to subjectivity. The data is taken over time and the trend of the results of the procedures is graphed as they are carried out; with this method, changes (advances or setbacks) that occur in clinical performance are.[5]

The S.C.A.R.E. implemented a video tutorial explaining the steps to enter the application and perform its management, even from devices such as the iPad or the website (https://itunes.apple.com/co/app/cusum-para-ipad/id807681448?mt=8); The workshops have online software to carry out this model, and psychomotor skills workshops have been held at the national level (Bogotá-Manizales) and internationally (Dominican Republic, Guatemala).

What does the Cusum consist of?

This method allows identifying the number of cases in relation to individual learning variation, it uses the Cartesian plane, where the Cusum value is presented on the Y axis and the number of procedures performed on the X axis. Alpha and beta errors and the percentage of acceptable (h0) or unacceptable (h1) failure are defined for the activity graph. When the participant is between the decision limits h0 and h1 is within the learning curve and only when crossing the decision limit h0, it can be considered that he has become efficient in carrying out said procedure (competence). In the event that it does not exceed the lower limit in time and instead crosses the upper limit h1, the causes of why it failed to obtain the learning or performance should be sought and a personalized improvement intervention should be made. Figure 1 shows that the participant crosses the Cusum h0 limit in approximately 45 attempts (Graph 1).[6]
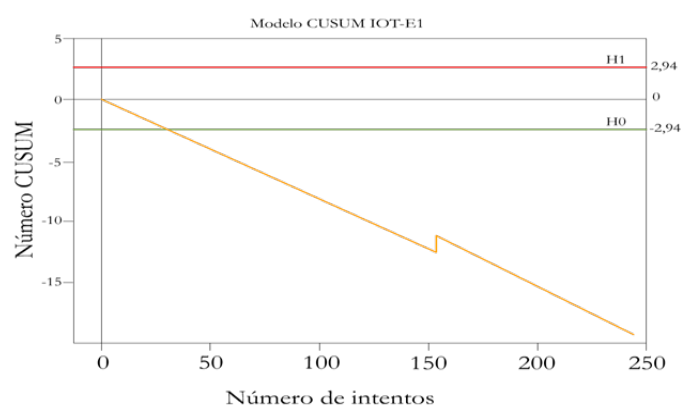
Graph 1 Cusum model.[5]

Clinical importance

Everything that is done for the safety of the patient must be greeted vehemently, and as the famous phrase of discards, "the most important thing to achieve a scientific purpose is the method", that is, if an appropriate method is used, the result it will necessarily be positive. The Cusum is a method of statistical analysis that allows evaluating, certifying and accrediting the acquisition of competencies in an objective and individualized way and that can be used in various clinical practices (such as anesthesiology) to obtain standards of medical services with safety and quality.[7] It is an evaluation tool for the practice-based learning model that promotes patient safety.

a. In orthopedics it has been used to monitor procedures such as hip replacement, to control complication rates.[8]

b. In surgery, it is proposed as a method to monitor healthcare activity and optimize clinical research.[9]

c. In obstetrics to evaluate ultrasound performance.[8]

d. In anesthesiology it has been used successfully in the evaluation of learning of regional anesthesia procedures, airway management, venous and arterial catheterization, etc.[10–13]

Conclusion

This reflection article highlights a statistical method of learning based on practice, called accumulated sums or Cusum whose importance lies in the personalized evaluation of learning. It is a method that has already been tested in clinical practices in orthopedics, surgery, obstetrics, anesthesiology, etc; It can be considered as a safety tool for patient management. The S.C.A.R.E has been implementing it as a psychomotor skills training course-workshop at a national and international level

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Conflicts of interest

Author declares that there are no conflicts of interest.

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