

Nursing workload to verify nurse/patient ratio at a cardiology ICU*

CARGA DE TRABALHO DE ENFERMAGEM PARA QUANTIFICAR PROPORÇÃO PROFISSIONAL DE ENFERMAGEM/PACIENTE EM UTI CARDIOLÓGICA

CARGA DE TRABAJO EN ENFERMERÍA PARA CUANTIFICAR LA PROPORCIÓN PROFESIONAL DE ENFERMERÍA/PACIENTE EN UCI CARDIOLÓGICA

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ABSTRACT

This is a descriptive study, aiming at comparing the nursing workload in a post-operative heart surgery unit (UPOCC) using NAS, TISS-28 and NEMS, and verifying both the observed and recommended nursing staff-to-patient ratio according to the workload indexes used. Data collection happened in a University Hospital, from October to November, 2004. The sample included 55 patients, resulting in 283 nursing workload measurements. The nursing workload measured by NAS (73.7%) was statistically higher than TISS-28 (66.2%) and NEMS (59.7%). The average of nursing staff-to-patient ratio estimated by NAS (1:1), TISS-28 (0.8:1) and NEMS (0.8:1) were lower than the observed ratio in the unit (1.2:1). We concluded that NAS measured a higher nursing workload and showed a nursing staff-to-patient ratio similar to the results found in the unit studied.

KEY WORDS

Intensive Care Units.
Workload.
Nursing care.
Nursing staff, hospital.

RESUMO

Trata-se de estudo descritivo, cujos objetivos foram comparar a carga de trabalho de enfermagem em unidade de pós-operatório de cirurgia cardíaca indicada pelo NAS, TISS-28 e NEMS, e também verificar a proporção profissional de enfermagem por paciente existente na unidade e a proporção necessária, segundo os índices utilizados. Os dados foram coletados em um hospital-escola de outubro a novembro de 2004. A amostra, constituída de 55 pacientes, totalizou 283 medidas de carga de trabalho. A carga de trabalho mensurada pelo NAS (73,7%) foi estatisticamente superior ao do TISS-28 (62,2%) e ao do NEMS (59,7%). A proporção média de profissionais de enfermagem por paciente, estimada pelo NAS (1,0:1), TISS-28 (0,8:1) e NEMS (0,8:1) foi inferior ao observado na unidade (1,2:1). Concluiu-se que o NAS quantificou maior carga de trabalho de enfermagem e apresentou uma relação profissional de enfermagem por paciente mais próxima ao observado na unidade estudada.

DESCRIPTORES

Unidades de Terapia Intensiva.
Carga de trabalho.
Cuidados de enfermagem.
Recursos humanos de enfermagem no hospital.

RESUMEN

Estudio descriptivo cuyos objetivos fueron comparar la carga laboral de enfermería en el servicio post-operatorio de cirugía cardíaca según el NAS, TISS-28 y NEMS, y verificar la proporción profesional de enfermeros por paciente existentes en la unidad, así como la proporción necesaria según los índices utilizados. Los datos fueron recolectados en un hospital-escuela de octubre a noviembre del 2004. La muestra constituida por 55 pacientes, totalizaron 283 medidas para la carga de trabajo. Esta variable fue medida por NAS (73.7%) siendo estadísticamente superior al TISS-28 (62.2%) y al NEMS (59.7%). La proporción promedio de profesionales de enfermería por paciente, estimado por el NAS (1.0:1), TISS-28 (0.8:1) y NEMS (0.8:1) fue inferior a lo observado en la unidad (1.2:1). Se concluyó que el NAS cuantificó mayor carga de trabajo de enfermería y presentó una relación profesional de enfermería/paciente con mayor cercanía a la observada en la unidad estudiada.

DESCRIPTORES

Unidades de Terapia Intensiva.
Carga de trabajo.
Atención de enfermería.
Personal de enfermería en hospital.

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INTRODUCTION

The quantitative prediction of the nursing staff is a process that should take into account the workload at the hospitalization units, which, in turn, is related to the healthcare necessities of the patients, as well as the intended type of care⁽¹⁾. This process can be put in practice by applying a method that permits the measurement of variables interfering in the nursing workload.

In practice, nurses often argue with the institution management about the need to increase or maintain human resources. These discussions become vulnerable because they lack a methodology with well-defined parameters in operational terms for the dimensioning of the nursing staff⁽²⁾.

The Federal Nursing Council – *Conselho Federal de Enfermagem (COFEN)*, aiming to orient nursing staff dimensioning in healthcare institutions, established parameters for the minimum number of nursing professionals with different educational levels, considering the required level of healthcare complexity by hospital units, according to Resolution 293/2004⁽³⁾. Based on the Patient Classification System and for calculation purposes, the Resolution considers nursing healthcare hours for each type of client per bed, in a 24-hour period, with 17.9 hours as the highest value, for intensive care,.

However, observations of daily routine at the ICUs can fragilize this resolution, since it does not consider the diversity of the patients receiving care at these units, nor the available resources and changes in the same patient's demand for nursing care during the hospitalization period.

According to Regulation 123/2005 of the Health Ministry, which defines High Complexity Cardiovascular Healthcare Units and High Complexity Cardiovascular Reference Centers, the basic composition of the nursing team should include one nurse for every three beds and one nursing technician or auxiliary for every two beds per work shift⁽⁴⁾. At this ratio, nursing healthcare hours per patient per day are higher than those defined by the COFEN, corresponding to 20 hours⁽⁵⁾.

In nurses' daily practice, in view of the ICU staff numbers, what is observed in each shift is the empirical distribution of the nursing team according to the number of patients. Such a distribution is performed by the nurse, and depends on her professional experience when evaluating, at the bedside, the gravity and nursing workload required by the patient at that moment, based on his clinical instability, therapy procedures to be performed, hygiene procedures, number of bandages, among others, so as to avoid overloading the involved professionals and maintain the quality of the healthcare delivered.

In this perspective, it is believed that the instruments that measure the nursing workload at ICUs are useful to quantify the required number of nursing professionals, according to the unit's demand.

Among existing indexes, the use of the Therapeutic Intervention Scoring System – 28 (TISS-28)⁽⁶⁻⁷⁾ and its simplified version, Nine Equivalents of Nursing Manpower use Score (NEMS)⁽⁸⁾ has been observed worldwide. Both consist of items related to therapeutic interventions, which receive a specific score.

TISS-28 is made up of items related to basic activities, ventilatory, renal, neurologic, metabolic supports and specific interventions⁽⁶⁻⁷⁾. NEMS includes standard monitoring, intravenous medication, mechanical ventilation, supplementary ventilatory support, single or multiple vasoactive medication, hemofiltration techniques and specific interventions at the ICU and outside⁽⁸⁾.

The total score of the TISS-28 and NEMS items is used for measuring the nursing workload in a 24-hour period⁽⁹⁾.

However, it is important to consider that TISS-28 covers only 43.3% of the time the nursing team uses in care delivery for an ICU patient. Therefore, TISS-28 underwent a large revision and changes in 2001⁽¹⁰⁾. In order to adjust the index so as to determine the nursing activities that best represent the nursing workload at the ICU, some items were excluded, grouped or added, with the new index having 23 items and being named Nursing Activities Score (NAS).

Differently from the indexes based on therapeutic interventions, the NAS score represents the calculation of the percentage of nursing time dedicated to the execution of the nursing activities listed there in a 24-hour period. NAS includes, besides the therapeutic interventions, hygiene, mobilization and placement procedures, support and care for family members and patients and administrative and managerial tasks.

The possibility of measuring the nursing workload at the ICU objectively is an invitation for the application of these instruments in all types of intensive care units, which will favor their improvement.

Thus, considering the existence of tools that would make it possible to measure the nursing workload at the ICU and their potential applicability, this study intends to analyze the nursing professional/patient obtained by applying instruments that measure the nursing workload in relation to what was observed in a heart surgery post-operative unit.

The goal of this study is to support nurses so that daily nursing healthcare provision for the ICU patients can be less subjective, more practical, real, based on scientific data and aiming to guaranteeing the quality of the healthcare delivered.

In nurses' daily practice, in view of the ICU staff numbers, what is observed in each shift is the empirical distribution of the nursing team according to the number of patients.

OBJECTIVES

- Compare the nurse workload in an post-operative heart surgery Intensive Therapy Unit, as defined by NAS, TISS-28 and NEMS.
- Verify the nursing staff-to-patient ratio established by the nursing workload quantifying instruments and the daily assignments of ICU employees.

METHOD

This is a descriptive, correlational study performed at the Post-Operatory Heart Surgery Unit – *Pós Operatório de Cirurgia Cardíaca (UPOCC)*, made up of 5 beds, in Hospital São Paulo (HSP) of Universidade Federal de São Paulo (UNIFESP), located on the south side of the city of São Paulo.

The sample was made up of patients admitted at the UPOCC in October and November, 2004, who remained there for at least 24 hours.

The data collection instrument consisted of four parts: Part I – Patient Identification Data; Part II – Patient ICU Hospitalization Data; Part III – Data about the nursing workload (TISS-28, NEMS and NAS); Part IV – Description of the daily schedule of the nursing team.

After being approved by the UNIFESP Review Board, the project started with data collection.

Daily, during the afternoon shift, data were collected based on information contained in the medical records, as well as verbal information provided by the nursing team which was not registered.

The daily number of nursing professionals in each shift was obtained through the daily schedule, considering the number of nursing professionals who provided direct care to the patient (nurses/residents/nursing auxiliaries and technicians). These data, referring to each work shift, were collected daily and transformed in average figures for the purpose of this research.

For the daily quantification of the number of patients in each shift, those who were admitted in each shift were considered during the data collection period.

The nursing staff-to-patient ratio was calculated by dividing the total number of nursing professionals in each shift by the number of beds occupied per work shift. The conversion in hours was done considering the equivalence of one TISS-28 and NEMS point to 10.6 minutes of the time of an ICU nursing professional. The transformation of hours

in percentage values was calculated by observing the relation of hours consumed in the 6-hour shift.

The quantification analysis of the number of professionals needed according to the three indexes was performed by considering the average of the sum of the daily scores, with 100% meaning that one nursing professional was needed per shift.

The comparison between the percentage of nursing time according to TISS-28, NEMS and NAS was done by using the block variance analysis model. For multiple comparisons, Bonferroni's correction was used. The adopted level of significance was 5% ($p \leq 0.05$).

RESULTS

Characterization of the sample

In the studied period, 62 patients were admitted at the UPOCC. Of these, 55 met the inclusion criteria of the research.

Of the sample patients, 32 (58.2%) were male. Average age was 62.7 years, varying from 19 to 85, with a standard deviation of 12.9 years.

On the average, patients spent at the unit, varying between 1 and 69 days. The death rate was 7.4%.

Most patients (61.8%) were admitted at the unit from the Surgical Center, followed by 23.6% from other units, 9.1% from other hospitals and 3.6% from the emergency service. One of the patients (1.8%) came to the unit from his home.

Nursing care demands at the UPOCC

From the 55 sample patients, 283 TISS-28, NEMS and NAS samples were obtained. The average values of the three indexes during the two months of the research were 25.4 points, 24.4 points and 73.7%, respectively.

The average time spent by the nursing team in care delivery to the patient per turn was 62.2% (SD = 15.9), 59.7% (SD = 16.7) and 73.7% (SD = 16.1), when measured by TISS-28, NEMS and NAS, respectively. Comparing the average values of the three indexes with the block variance analysis yielded significant differences. The TISS-28 average was higher than the NEMS average ($p = 0.003$). NAS average was higher than the TISS-28 average ($p=0.001$) and the NEMS average ($p=0.001$).

Figures 1 and 2 show the daily variation of time spent (%) by the nursing team when providing care to patients in October and November.

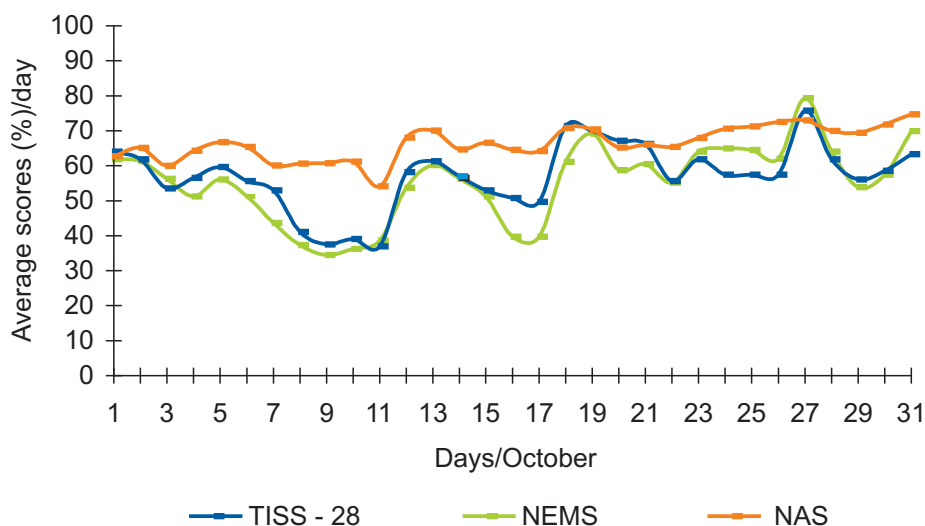


Figure 1 – Daily average time (%) used to provide nursing care, according to TISS-28, NEMS and NAS during the month of October, at the Heart Surgery Post-Operatory Unit, UNIFESP – São Paulo, 2005

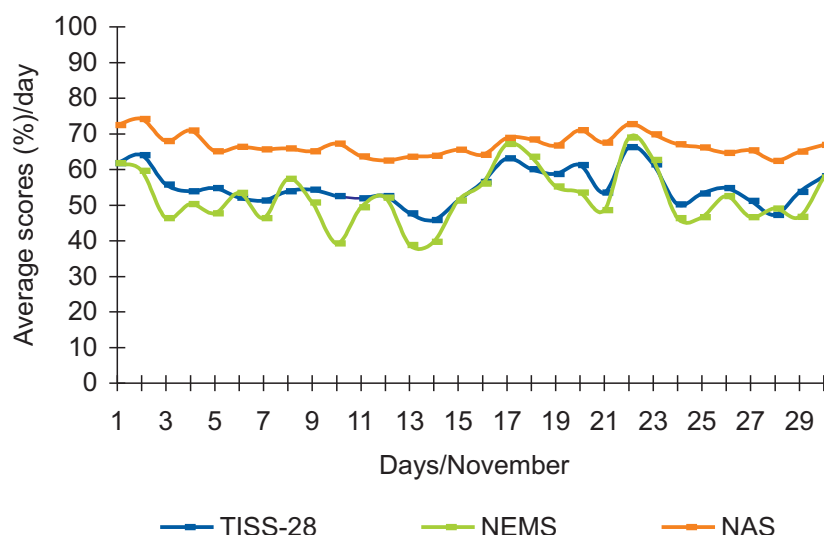


Figure 2 – Daily average time (%) used to provide nursing care, according to TISS-28, NEMS and NAS during the month of November, at the Heart Surgery Post-Operatory Unit, UNIFESP – São Paulo, 2005

Nursing staff-to-patient ratio

On figures 1 and 2, it can be observed that NAS presented higher average values, followed by TISS-28 and NEMS. The scores dropped at weekends and holidays.

The average number of employees at the unit and the nursing staff-to-patient ratio for the morning, afternoon and night shifts are presented in Table 1.

Table 1 – Descriptive measures of the amount of nursing professionals and patients in each work shift. Post-Operatory Heart Surgery Unit, UNIFESP – São Paulo, 2005.

	Morning		Afternoon		Night	
	Professionals	Patients	Professionals	Patients	Professionals	Patients
Average	5,2	3,8	4,1	3,9	4,1	3,8
Standard Deviation	1,9	1,0	0,8	1,0	0,9	1,0
Median	5,0	4,0	4,0	4,0	4,0	4,0
Minimum	3,0	1,0	3,0	2,0	3,0	1,0
Maximum	9,0	5,0	6,0	5,0	8,0	5,0

According to Table 1, the average number of nursing professionals was higher in the morning shift than in other periods. There was no variation regarding the minimum number in the three shifts. In a unit with five active beds, there was a minimum of three nursing professionals in each work shift. Overall, the average number of nursing professionals at the unit was 4.5, and the patients' was 3.8, with the average ratio being 1.2 nursing professional per patient.

When looking at the number in each studied month, it was verified that a higher nursing staff-to-patient ratio was maintained in the morning shifts during October (average 1.5:1, varying from 0.8 to 3.0) when compared with the afternoon (average 1:1, varying from 0.6 to 1.7) and night shifts (average 1:1, varying from 0.6 to 2.0).

In November, a decrease in the ratio was observed in relation to October, but the nursing staff-to-patient ratio was still higher during morning shifts (average 1.0, varying from 0.6 to 1.8) when compared with the afternoon (average 0.9, varying from 0.6 to 2.0) and night shifts (average 0.9 varying from 0.6 to 2.5).

During the studied months, decreases in the nursing staff-to-patient ratio were observed during weekends, increasing again during weekdays.

Table 2 shows the estimated amount of professionals, using the three indexes, in view of the nursing workload measured.

Table 2 – Descriptive measurements of the necessary amount of nursing professionals, estimated according to TISS-28, NEMS and NAS, Heart Surgery Post-Operatory Unit, UNIFESP – São Paulo, 2005.

	NAS	NEMS	TISS-28
Average	3,6	3,0	3,1
Standard Deviation	0,7	0,8	0,7
Median	4,0	3,0	3,0
Minimum	2,0	1,0	1,0
Maximum	5,0	5,0	5,0

The estimated number of professionals necessary according to the three indexes varied from 1.0 to 5.0, as seen in Table 2. NAS presented a higher value in relation with the average (3.6) and the minimum (2.0) number of professionals necessary, when compared with TISS-28 and NEMS, which presented similar values.

Since the average number of patients admitted at the UPOCC in the studied period was 4.2 (3.8), the average nursing staff-to-patient ratio estimated by NAS, NEMS and TISS-28 was 1.0:1, 0.8:1 and 0.8:1, respectively.

DISCUSSION

Investigations performed in post-operative heart surgery units in Mexico⁽¹¹⁾ and Brazil⁽⁵⁾ showed that most pa-

tients were male, 67% and 66%, respectively, as observed in the present study (58.2%). The average age found in those studies was lower (52.1 and 57.7 years) than in this study (62.7 years).

As for the length of the patients' hospital stay at the unit, the Mexican study⁽¹¹⁾ was similar to the present study (4.5 and 4 days, respectively). The Brazilian study⁽⁵⁾, however, showed an average stay of 5.6 days and death rate of 10%. This can be justified by possible structural differences between the ICUs, as well as differences in the gravity of the patients' clinical state and the demand for nursing care, which may interfere in the length of patients' hospital stay and death rates.

Nurses have increasingly used ratios that measure the nursing workload at ICUs to verify the patients' healthcare demands, in order to establish the size of the staff according to these necessities.

Worldwide accepted indexes validated for the Brazilian reality include TISS-28⁽⁶⁻⁷⁾, NEMS⁽⁶⁾ and NAS^(10,12). However, these instruments have been more often applied in general ICUs (13-15).

A study performed in Mexico⁽¹¹⁾, aiming to compare the systems TISS-28, CTM and OMEGA in order to verify their relation with the costs and gravity of the post-operative heart surgery patient, concluded that TISS-28 is a useful instrument to measure the therapeutic intervention and the nursing workload at the studied ICU.

The inexistence of studies using NEMS and a single study⁽⁵⁾ that applied NAS in this specific type of population makes it difficult to compare data. However, by comparing the three indexes, the hospitalized patients' high demands for nursing care could be verified, occupying, on the average, between 59.7% and 73.7% of the time nursing professionals spend on care delivery for this kind of patient per shift.

The TISS-28 score observed in the aforementioned Mexican study was 38.6 points, varying from 16 to 74 points, i.e. 13.2 points above the general average of 25.4 TISS-28 points found in this investigation. This can also be explained by differences in the hospital structure and gravity of the patients among the countries, which in turn affects the nursing workload.

The lower index values at weekends can be explained by the lower number of therapeutic interventions during hospitalization, as well as the increased number of discharges, and also because elective surgeries are not performed on those days.

According to NAS, in this study, nearly 2/3 of a nursing professional's time (73.7%) during one shift was spent on care for a single patient. The average NAS value in this study was very close to another Brazilian study (74.62%), which evaluated the nursing team workload at a post-operative heart surgery unit, with the same index⁽⁵⁾. Other national studies performed in general ICUs also presented high

average NAS values, approximately 70%⁽¹³⁻¹⁴⁾. These data reveal a high demand for nursing care, indicating that a nursing professional is capable of full care delivery to one single patient per shift.

The percentage of time spent, reflected by NAS, presented a higher value when compared with the two other indexes. This can be explained because NAS consists of a higher number of nursing activities, resulting in nearly twice the nursing team time to care for a patient when compared to TISS-28 and NEMS⁽¹⁰⁾. Therefore, NAS is seen as a promising instrument to calculate the ICU nursing workload.

In the present study, the morning shift obtained higher average values for the total number of employees (5.2) and the nursing staff-to-patient ratio (1.4:1) when compared with the afternoon (4.1 and 1:1) and night shifts (4.1 and 1.1:1). This can be explained because, since this is a teaching hospital, the unit has about two or three nursing residents in addition to the professionals who make up the work schedule, providing integral care to the patients in the aforementioned period. It is worth noting that the nursing residents are professionals who work at the unit for a determined time, and who demand training and monitoring by other professionals, especially nurses working in the sector. If these students did not really work at the unit, the nursing staff-to-patient ratio would be lower in the morning shift (1:1), similar to the other work shifts.

The need for professionals, according to the demand for nursing care (Table 2), estimated by NAS (3.6) and TISS-28 (3.1) or NEMS (3.0), was lower than what was observed at the unit (4.5). Thus, the nursing staff-to-patient ratio calculated according to NAS (1.0:1), TISS-28 (0.8:1) and NEMS (0.8:1) was also lower than what was observed at UPOCC (1.2:1). However, it is observed that the NAS ratio was closest to the unit's actual ratio.

The ratio established by the Ministry of Health for the composition of the nursing professional/patient level at a Type II ICU is 0.7:1, considering one nurse for every five beds⁽¹⁶⁾. Considering a post-operative heart surgery ICU, this ratio would be 0.8:1, with one nurse for every three beds⁽⁴⁾. These values are similar to those estimated by the indexes, but it is important to note that the coverage of TISS-28 and NEMS does not reach 50%, and even NAS does not cover 100%⁽¹⁰⁾. Therefore, this aspect needs to be understood when the indexes are used, because there is a more in-depth analysis.

Studies about the nursing team's time in intensive care delivery for a patient, calculated with NAS, have revealed

important results, especially when related to the application methodology⁽¹³⁻¹⁵⁾.

In the recommendations of the *British Association of Critical Care Nurses*⁽¹⁷⁾, the nursing staff-to-patient ratio for cases of unconscious patients under mechanical ventilation is 1:1, and the proportion in any other intensive care area should not be inferior to one nurse for every two patients. Likewise, the *European Society of Intensive Care Medicine*⁽¹⁸⁾ suggests that a 1:1 nursing staff-to-patient ratio is essential, and the nursing workload of a single nurse should not exceed 40-50 TISS points.

Considering that the excessive nursing workload, defined by the nursing/patient hours or the nursing staff-to-patient ratio, is associated with the increasing death rates at the ICU and, in view of the NAS performance, the potential of this index is observed as a tool to aid nurses in ICU management.

It is important to note that only the quantitative composition of the nursing team is not enough to guarantee care quality and patient safety at the ICU. There is a need for qualified staff, either by demanding formal titles or competency development through in-service training⁽⁴⁾.

CONCLUSIONS

The average quantitative workload of the nursing team in care delivery to UPOCC patients as measured by NAS (73.7%) was statistically higher than TISS-28 (62.2%), which in turn was higher than NEMS (59.7%).

The average nursing staff-to-patient ratio estimated by NAS (1.0:1), TISS-28 (0.8:1) and NEMS (0.8:1) was lower than the ratio observed at the UPOCC (1.2:1).

As NAS is based, overall, on specific activities of the ICU nursing team, it was considered more adequate to estimate the number of nursing professionals than TISS-28 and NEMS. Its results got closest to the levels observed at the UPOCC.

In this study, the choice to exclude patients who remained less than 24 hours at the UPOCC could have led to the underestimation of the actual nursing workload at the unit, which constitutes a limitation for the analysis of the results.

Taking into account the complexity of post-operative heart surgery patients and the high demand for nursing care, the importance of support through objective instruments that favor the use of a uniform language for better nursing staff dimensioning is highlighted, with a view to providing healthcare with quality and security.

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