Implementation of the Munro scale for perioperative pressure injury risk assessment

Implantação da escala Munro de avaliação de risco de lesão por pressão no perioperatório

Implantación de la escala de evaluación de riesgos de Munro para lesión por presión perioperatoria

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ABSTRACT: **Objective:** To describe the implementation of the Munro scale in electronic medical records to assess the risk of pressure injury in patients in the perioperative period. **Method:** Experience report on the process of implementing the Munro scale electronic system in a large philanthropic hospital located in the city of São Paulo, with 40 nurses. **Results:** The Munro scale was implemented in the electronic medical record, with a quick view of its result in safety alerts on the surgical map panel. To use the technique, 40 nurses were trained in two stages: in the distance learning modality and in person, when they followed its application. Three of these professionals required one more day of follow-up and five had queries about the applicability criteria after training. **Conclusion:** The implementation of the Munro scale was completed in the proposed primary unit, and the systematic risk determination and implementation of preventive measures contributed to avoid perioperative pressure injuries. The electronic system provided agility for implementation, and the alerts and visualization on a surgical map improved communication with the team in the identification of risk; there were few queries about the process or any items of the scale.

Keywords: Risk assessment. Perioperative nursing. Pressure ulcer. Electronic health records.

RESUMO: **Objetivo:** Descrever a implantação da escala Munro de avaliação de risco de lesão por pressão em pacientes no período perioperatório no prontuário eletrônico. **Método:** Relato de experiência do processo de implantação em sistema eletrônico da escala Munro em um hospital filantrópico de grande porte localizado no município de São Paulo, com 40 enfermeiros. **Resultados:** Foi implantada a escala Munro no prontuário eletrônico, com visualização rápida do seu resultado em alertas de segurança em painel do mapa cirúrgico. Para utilizar a técnica, 40 enfermeiros foram treinados em duas etapas: na modalidade ensino a distância e presencialmente, quando acompanharam sua aplicação. Três desses profissionais necessitaram de mais um dia de acompanhamento e cinco apresentaram dúvidas quanto aos critérios de aplicabilidade após o treinamento. **Conclusão:** A implantação da escala Munro foi concluída na unidade primária proposta, a determinação de risco sistematizada e a implementação de medidas preventivas contribuiu para evitar lesões por pressão no perioperatório. O sistema eletrônico proporcionou agilidade para implantação, e os alertas e a visualização em mapa cirúrgico melhoraram a comunicação com a equipe na identificação do risco; poucas foram as dúvidas sobre o processo ou itens da escala.

Palavras-chave: Medição de risco. Enfermagem perioperatória. Lesão por pressão. Registros eletrônicos de saúde.

RESUMEN: **Objetivo:** Describir la implementación de la escala de evaluación de riesgo de lesión por presión de Munro para pacientes perioperatorios en la historia clínica electrónica. **Método:** Relato de experiencia del proceso de implementación del sistema electrónico escala Munro en un gran hospital filantrópico de la ciudad de São Paulo, con 40 enfermeros. **Resultados:** Inserción de la escala Munro en la historia clínica electrónica con visualización rápida del resultado de la escala en alertas de seguridad y panel de visualización del mapa quirúrgico. En el proceso de implementación de la escala se capacitaron 40 enfermeras en la modalidad a distancia y posterior seguimiento de la aplicación con capacitación presencial. De los 40 enfermeros, tres necesitaron un

día más de seguimiento y cinco tenían dudas sobre los criterios después de la capacitación. **Conclusión:** Se completó la implementación de la escala de Munro en la unidad primaria propuesta. La determinación sistematizada del riesgo y la implementación de medidas preventivas contribuyen a la prevención de las lesiones por presión perioperatorias. El sistema electrónico proporcionó agilidad para la implementación, las alertas y la visualización en un mapa quirúrgico mejoran la comunicación con el equipo en la identificación del riesgo y se presentan pocas dudas sobre el proceso o los ítems de la escala.
Palabras clave: Medición de riesgo. Enfermería perioperatoria. Úlcera por presión. Registros electrónicos de salud.

INTRODUCTION

Perioperative pressure injuries stand out among adverse events resulting from avoidable surgical and anesthetic complications[1]. Studies describe the incidence of pressure injuries with wide variation, reaching 77%[2]; the treatment for this type of lesion is associated with its high costs.

Despite technological advances, pressure injuries resulting from surgical positioning represent a challenge in clinical practice, as they depend on a set of factors, the quality of care provided being essential to avoid them[3].

In the care process, prevention may be associated with risk determination, whose early assessment is a challenge to be overcome with the Munro scale. Having previously determined the risk, it is possible to adapt preventive measures and apply best care practices in each phase of the perioperative period.

The risk of pressure injuries from surgical positioning is a diagnosis made by nursing, and interventions include the use of support surfaces, protection of bony prominences, monitoring of surgical positioning and assessment of skin conditions and risk[4].

As a risk assessment, the Munro scale consists of three moments: preoperative, with six risk categories: mobility, nutritional status, body mass index (BMI), recent weight loss, age, comorbidities; perioperative, with seven categories: classification according to the American Society of Anesthesiologists (ASA) scale, type of anesthesia, body temperature, hypotension, humidity, surfaces and surgical position; and postoperative, with two risk categories: duration of perioperative period and blood loss[5,6].

In the preoperative phase, a score of 5 or 6 represents low risk; between 7–14, moderate risk; and 15 or greater, high risk. The preoperative score is then added to the items evaluated intraoperatively, and its cumulative factor determines score 13 as low risk; 14–24 as moderate risk; and 25 or more as high risk. Finally, in the postoperative period, the total intraoperative score is added to the items evaluated after the surgical procedure, so 15 represents low risk; 16–28, moderate risk; and 29 or more, high risk[5,6].

Created in 2010 in the United States, the scale was included in the recommendations of the Association PeriOperative Registered Nurses (AORN) as a tool to assist in injury prevention[1] in 2014, when it was disseminated to all states. Its use has also been recently described in China[7], Turkey[8] and Italy[9]. To date, it is the only scale used to dynamically assess the risk of pressure injury in adult surgical patients in the perioperative period.

A score (from 1 to 3) is assigned to all items of each perioperative phase on the scale, according to which the higher the score, the greater the risk for the patient. In the preoperative period, the Munro is applied when the patient is admitted to the inpatient unit; then, the result determines the intraoperative risk and again the risk at the end of the procedure, when transferring the patient from the table to the bed. This result in turn determines the risk for the immediate postoperative period. Finally, the scale is applied upon discharge from the anesthesia recovery room, and the score determine the immediate postoperative risk.

The tool was translated, adapted and validated into Brazilian Portuguese, with good validity and reliability[10]. The study on its predictive validity showed that the value of the area under the ROC curve of the intraoperative risk score for pressure injury was 0.874, sensitivity was 85.92%, and specificity was 78.41%. The value under the same curve for the postoperative score was 0.774; sensitivity was 67.73%; and specificity was 80.58%, which leads us to conclude that the scale is very effective in predicting the risk of pressure injuries[11].

In another study with predictive validation, results were similar for the ROC curve: preoperative: 0.653; intraoperative: 0.872; and postoperative: 0.868, meaning that the Chinese version of the scale is more adequate to assess the risk of pressure injury in surgical patients[7].

In clinical practice, the risk must be determined before the beginning of a surgical procedure, so that, in the operating room, preventive measures are prepared beforehand and

serve as an alert for the assistant nurse, who must periodically evaluate the patient, paying attention to any changes in risk in that timeframe.

This professional is responsible for providing direct assistance, identifying risks and intervening with appropriate measures to avoid damage, increasing patient under his/her responsibility's safety. With this in mind and in search of assessments that can determine risks before admission to the operating room, as well as help in assisting in perioperative evolution, we chose the Munro Scale to be implemented in our institution, a large general hospital where surgical procedures of low to high complexity are carried out every day.

OBJECTIVE

To describe the implementation of the Munro scale in electronic medical record to assess the risk of pressure injury in patients in the perioperative period.

METHOD

This is an experience report describing the creation and implementation of the Munro scale to assess risk of injury in perioperative patients in a large philanthropic hospital located in the city of São Paulo, from November 2021 to January 2022.

The operating wing of the study hospital has 17 preoperative beds, 24 operating rooms, including two with robotic technology, two with laminar flow and a neurological suite, in addition to 27 anesthesia recovery beds. An average of 1,500 surgeries of varying sizes and specialties are performed per month in this wing.

In the preoperative ward and in the surgical center of two hospital units, 40 nurses from the pre-, peri- and postoperative phases were included in the training, working the morning, afternoon and night shifts, except those who were on vacation or sick leave in the implementation period. All participants signed an attendance list and their participation was documented in their training history.

The Munro scale includes the operative phases (pre, peri and post) with respective assessment items, to which a score is assigned (from 1 to 3). Each phase has a (cumulative) risk determination score. A summary of the items' description is shown in Chart 1; it can be downloaded in full from www.escalamunro.com.

The first stage consisted of three elements:

1. Insertion of the Munro scale in a Philips' electronic medical record, in the Score Flex II module, within scales and indices, with the three phases of scale application and respective items and scores for automatic calculation;
2. Determining risk using electronic medical records; and
3. Application of the result measured by the scale in security alerts for quick identification by any member of the nursing team when accessing the electronic medical record.

The Score Flex II module is a function within the Philips system for immediate insertion of scales and indices by the institution, in which one records the scale, assessment items and score per item, the results and reference of the validated scale.

At the end of the first stage, a one-day pilot program was implemented to validate the usability of the system regarding the scale. This initiative showed the need to identify comorbidities more easily, without opening the "Result" field, since these are separated one by one because of the "Score Flex II" icon's function.

As the team is provided with the surgical map view panel along the aisles and in medical comfort, whose architecture was developed internally by the information technology team, all moderate or high Munro scale cases were added to this panel so that any member of the surgical team can see it.

The second stage (implementation) started with the training of the nursing team in two moments: at first, virtually, through the SAP SuccessFactors platform, under the theme "Skin assessment and inspection in patients undergoing a surgical procedure: pressure injury prevention", addressing pressure injuries, citing the use of the new tool to assess risks and measures to be implemented during patient follow-up.

The training was developed by the corporate education nurse in partnership with the surgical center nurse and the stomatherapist, covering the team training action plan on injuries and preventive measures, including perioperative risk assessment.

The team participated in person in the second session, in which the tracer method was applied, that is, a follow-up of the patient from the beginning to the end of the process. Initially, the concept of the scale and its usability were explained and then each professional was guided on the evaluation period, the criteria and its completion in an electronic

Chart 1. Munro scale in each implementation phase and assessment item with corresponding score.

Implementation phase	Assessment items	Score
Preoperative	Mobility	1. Not limited 2. Very limited 3. Completely immobile
	Nutritional state (Length of NPO)	1. ≤ 12 h 2. 12–24 h 3. ≥ 24 h
	BMI	1. ≤ 30 kg/m^2 2. 30–35 kg/m^2 3. ≥ 35 kg/m^2
	Weight loss (last 30–180 days)	1. Up to 7,4% or unchanged 2. 7,5–9,9% 3. > 10%
	Age	1. 39 or younger 2. 40–59 3. 60 or older
	Comorbidities (one point per comorbidity)	Smoking, hypertension, vascular disease, kidney disease, heart disease, and lung disease, history of pressure injury, and diabetes
5 or 6 = low risk; 7–14 = moderate risk; 15 or more = high risk		
Intraoperative	ASA	1. Asa 1 e 2 2. Asa 3 3. Asa > 3
	Anesthesia	1. Sedation and location 2. Regional 3. General
	Body temperature fluctuation	1. < 2°C Change or unchanged 2. 2°C change 3. 3°C change
	Hypotension (fluctuation in systolic blood pressure — SBP)	1. Unchanged or < 10% 2. Change from 11 to 20% 3. Change from 21 to 50%
	Moisture	1. Dry 2. Some moisture 3. Pooled or heavy fluid
	Surface and movement	1. None/use of thermal blanket on the body/fixed position 2. Use of aids/thermal blanket under the body/fixed position 3. Shear force/added pressure/variable position
	Surgical position	1. Lithotomy 2. Lateral 3. Supine/prone
13 = low risk; 14–24 = moderate risk; 25 or more = high risk (add preoperative total for Munro calculus to intraoperative total)		
Postoperative	Duration of perioperative period	1. Up to 2 h 2. 2–4 h 3. >4 h
	Blood loss	1. Up to 200 mL 2. 200–400 mL 3. >400 mL
15 = low risk; 16–28 = moderate risk; 29 or more = high risk (intraoperative total for Munro calculus is added to the postoperative total)		

system. Queries were also discussed, repeating the follow-up cycle until all professionals felt confident about it (Figure 1).

We proposed to start the application in the preoperative unit of the surgical wing, with the nursing team under the same management, also responsible for 60% of the surgical admission and preparation, and slowly expanded it to the hospitalization units in April 2022, for better monitoring of processes. In the same year, it was implemented in February in the hospital units of Itaim, also in the capital of São Paulo, and in April in Brasília, the Federal District.

RESULTS

In the first stage, the scale was registered by the clinical informatics nurse in the Score Flex II model, in the icon "Scales and indices" of the Philips system, following the assessment items composed by the Munro scale (Figure 2).

Figure 1. Flowchart of the Munro Scale implementation process; 2022.

In this process, data already registered cannot be imported, which again requires manual input of information. However, the automatic calculation and result determination eliminates the need to consult the score to classify the result.

Subsequently, the information technology business analyst inserted the results of the scale into security alerts so that any team member could see it when opening the electronic medical record, without the need to open the "Scales and indices" field (Figure 3).

Then, the system developer inserted the scale result in the surgical map panel and color-coded them, expanding the view of the Munro scale result, in addition to the electronic medical record, by any team member (Figure 4).

In the second phase, while the system was being developed, a mandatory virtual training was applied to all team members in an internal training platform. Attendance was controlled by the corporate education nurse.

In the in-person training, of the 40 participants, only three needed to be followed up for another day when filling in to master the process; as for the evaluation criterion, five participants had some queries days after the training. None of the professionals expressed having doubts in handling or filling in the system fields.

As for the assessment items in the preoperative phase, the Munro scale requires knowledge and mastery of the nurses at the admission unit, as they need to add the question about weight loss in the last six months to the patient's assessment routine. The other items are relevant to the initial assessment and physical examination, so the workflow did not require change.

We did not propose interventions in the preoperative period because we understood that the intraoperative nurse was the one who mastered measures such as adhesive dressings in pressure areas related to surgical positioning.

For the perioperative phase, the scale comprises aspects of assessment resulting from the surgical procedure, and these are the domain of surgical center nurses. For these professionals, the items related to temperature and blood pressure generated more queries, since we did not measure the temperature of all patients during the procedure, but at the end of it, for calculation purposes.

The need to memorize a formula to detect the percentage of systolic blood pressure loss was initially questioned in the training, but with the frequency of evaluations, it would soon be mastered and incorporated into the professionals' routine.

In the perioperative period, in turn, questions about position (variation of positions) and surfaces (identification of support surfaces) were common, while the moment of evaluation was questioned only by some nurses.
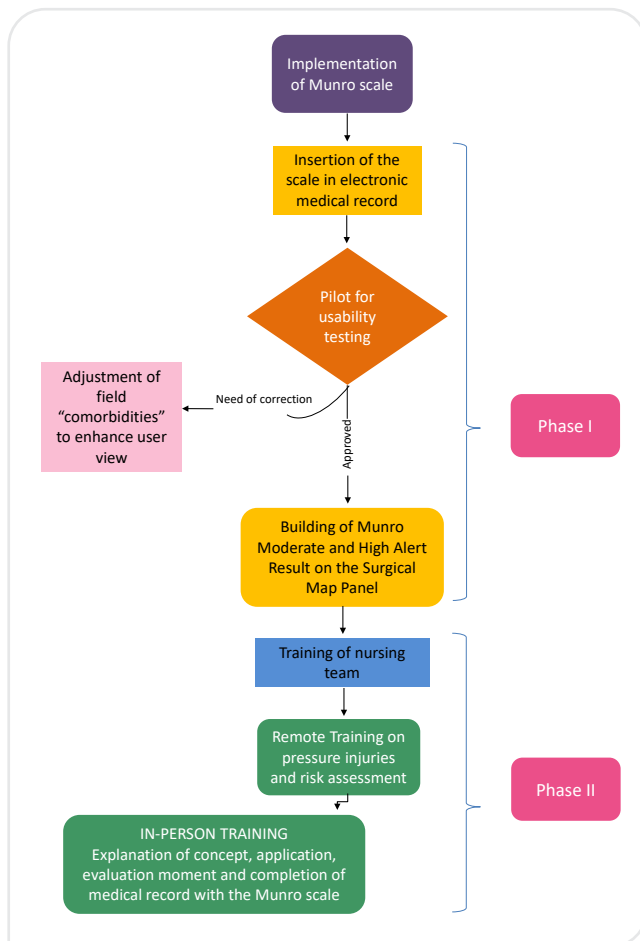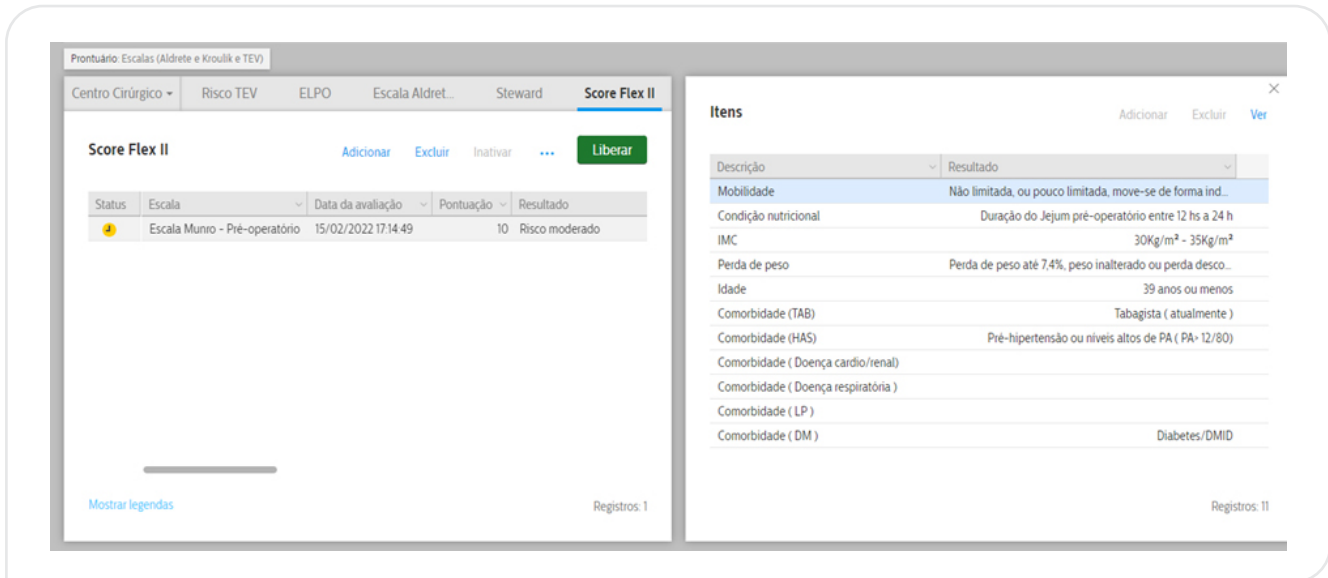
Figure 2. Preoperative Munro Scale in Score Flex II model in electronic medical record; 2022

Figure 3. Munro scale results presented in the security alert (first quick view screen when opening the medical record); 2022

Figure 4. View of Munro scale result in the surgical map of an operating room (red for high risk and orange for moderate); 2022

The interventions proposed for the intraoperative period considering the risk previously identified were a matter of discussion, but the necessary care for the patient was reinforced, especially when it comes to minor surgical procedures and preventive measures in outpatients.

In anesthesia recovery, the assessment items encompass completion of the procedure, measurement of perioperative time and sum of possible intraoperative and postoperative bleeding. The participants asked the training team about recording and consulting information about bleeding, which is available in the electronic medical record.

Also during anesthesia recovery, in case of patients with moderate and high risk, two techniques were instituted: skin assessment and change of position depending on the surgical procedure, when decompression measures were not possible.

Conclusion is that the Munro scale changed the nurses' conception of risk determination, which was done empirically while determining protection measures based on what they knew about the surgical procedure, that is, they intended more prevention measures for patients undergoing major or long-duration procedures.

During training, they realized that the risk was determined by the patient's characteristics, showing moderate risk even for small and short-duration procedures. The risk was previously informed to the intraoperative nurse, allowing them to prepare preventive measures, or delegate care in case of minor interventions while helping with larger or more complex ones. However, the risk worsened from one evaluation to another, going from low or moderate, in the preoperative period, to

moderate or high at the end of the procedure, allowing the implementation of measures in the immediate postoperative phase, thus interfering with the progression of pressure injury.

Another positive feature was the improvement in communication, since the scale determines the risk for the upcoming phase and, therefore, the teams working on pre, peri and postoperative areas expanded their communication when transitioning moderate- and high-risk patients.

Thus, risk-based preventive measures were implemented in advance in the perioperative and postoperative phases, expanding the scope of perioperative pressure injury prevention. This is expected to reduce the number of injuries resulting from positioning after this intervention.

The other members of the nursing team, in addition to the virtual training, were instructed on the view of the risk in the safety alert and the need to support the nurse in applying the scale, signaling the end of the procedure.

The score is cumulative, so each phase needs to be completed before moving on to the next.

During the implementation of this process, we had some failures such as forgetting a new process was in place and skipping phases, missing a patient's record, which required guidance to reinforce corporate communication and recurring reminders during the shift.

DISCUSSION

Inserting information into electronic medical records was essential for team adherence, since records are currently made electronically. One of the benefits found was the construction in a flexible field, which allows the insertion and application of scales, streamlining the implementation process.

Electronic medical records have become important tools not only for recording and organizing information, but above all as the main vehicle for quickly, easily and safely accessing and obtaining health data[12].

The difference in this structuring took place with the insertion of alerts and a panel with viewed by any member of the team, in addition to the orientation of the team towards consumption of information. Although alerts help to streamline the exchange of information, they can be ignored by someone, since it is a pop-up window that does not require data entry, so it is recommended to not be overloaded with information.

The surgical map panel is more comprehensive, with a quick and colorful view that draws the professional's attention. Early identification of patients at risk for injury allow

preventive measures to be instituted more quickly, with time to organize the necessary resources.

In this way, it is also possible to communicate with patients at risk in daily and brief meetings on safety called safety huddle, reinforcing the need for preventive measures and monitoring by nurses during the procedure and when evaluating patient.

A qualitative study on computerization led participants to perceive it as a resource offering more safety to the patient and agility in data management, besides avoiding patients' exposition to unnecessary risks. However, the infrastructure and technical training of the team in this study required improvement so they could effectively handle the system[13].

It should also be noted that nurses did not experience difficulties when operating the system or using the icon to enter results, as well as viewing the information generated by the score or accessing what had been recorded. However, its handling was taught individually during follow-ups, which may have been a differential.

Regarding queries and difficulties in applying the scale, although the level of knowledge was not measured at that moment, we found a similar scenario a study carried out in Singapore on the knowledge and attitude of perioperative nurses to identify risk of pressure injuries, of which 73% reported not having adequate experience in prevention and 88% posed queries about treatment strategies; overall knowledge about the topic was only 47.8%[14].

In another study conducted in Turkey on theoretical and practical knowledge about the care of patients with pressure injuries, the results pointing to greater practice or additional training correlated with knowledge were significant, so additional training is recommended to expand nurses' knowledge about pressure injuries[15].

It is possible that the combination of teaching strategies (virtual and in-person in tracer modality) has contributed to few uncertainties when applying the scale; however, frequent training on preventive measures and treatment is recommended to empower the perioperative nurse in clinical practice.

The results of a study on education for the effective use of the Munro pressure injury risk assessment scale by the perioperative team in the United States indicated that this group of professionals preferred the combination of learning modalities and media[16].

Implementing preventive measures based on structured risk assessment is part of the recommendations to avoid pressure injuries, and remains the main method applied in the formulation of these measures, so it is important that the tools selected for risk assessment are accurate and reliable[11].

The Munro scale translated into Brazilian Portuguese was validated along with the ELPO scale, with statistically significant values (p = 0.000) in the Friedman test and Spearman's correlation in the perioperative phase (0.30; p = 0.010)[9], and predictive validation with high sensitivity and specificity[7,11].

As recommended by the Joint Commission International (JCI), some of the features aimed at the prevention and care associated with pressure injuries are: patient assessment upon admission to identify risk, systematic risk assessment for pressure injuries, reassessment in defined intervals, implementation of risk-based preventive measures and staff training[17].

The Munro scale comprises systematic and periodic risk analysis, starting at patient admission, and reanalysis in the perioperative process. Its implantation in this institution allowed to train the team on risk assessment and implementation of preventive measures, reaching the objectives proposed by the JCI.

The implementation of the tool showed the importance of continuous monitoring and reassessment, since the worsening of the risk in the perioperative period was noticed due to extrinsic factors related to the surgical procedure. In this case, measures were implemented to prevent the progression of the pressure injury.

As it is common in procedural innovation, it takes some time to practice to be internalized and become part of the routine of a sector; therefore, it requires close monitoring and team awareness. One of the professionals' suggestions was to apply the tool to some patients until mastering it, and then gradually extend it to all who should be evaluated.

One of the limitations of this study was its application in only one center initially; with regard to its clinical practice, the implications refer to the importance of systematized risk analysis, implementation of preventive measures and opportunity for a second round of perioperative risk assessment, allowing each institution to adopt the tools that meet their needs.

CONCLUSION

The implementation of the Munro scale was completed in as proposed in the primary unit, with progressive expansion to cover the entire hospital. Systematized risk determination and implementation of preventive measures contributed to reducing perioperative pressure injuries, while the electronic medical record, alerts and views of the system helped to communicate patient risk. Professionals faced few difficulties during the implementation of the new tool, all attributable to training.

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CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTIONS

CSS: project administration, formal analysis, conceptualization, data curation, investigation, methodology, writing – original draft, writing – review & editing, supervision, validation, visualization. AAA: project administration, writing – review & editing, supervision, validation, visualization.

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