VALIDATION OF A MODIFIED CLAVIEN-DINDO CLASSIFICATION FOR POSTOPERATIVE COMPLICATIONS IN ORTHOPEDIC SURGERY

VALIDACIÓN DE LA CLASIFICACIÓN DE CLAVIEN-DINDO MODIFICADA PARA COMPLICACIONES POSTOPERATORIAS EN CIRUGÍA ORTOPÉDICA

VALIDAÇÃO DA CLASSIFICAÇÃO DE CLAVIEN-DINDO MODIFICADA PARA COMPLICAÇÕES PÓS-OPERATÓRIAS EM CIRURGIA ORTOPÉDICA

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En este trabajo científico los autores realizan una validación externa de una clasificación de complicaciones postoperatorias originalmente utilizada en cirugía general al ámbito de la cirugía Ortopédica y Traumatológica. De esta manera, los autores buscan utilizar un sistema unificado para clasificar complicaciones postquirúrgicas, a los fines de poder ordenarlas para realizar comparaciones entre distintas instituciones y grupos de trabajo.

Conceptos clave:

A) Que se sabe sobre el tema?
Las complicaciones postoperatorias son una causa frecuente de morbimortalidad en cirugía ortopédica y existe actualmente un subregistro de las mismas además de una falta de unificación de criterios sobre la gravedad de las mismas.

B) Que aporta este trabajo?
Este trabajo aporta un sistema unificado a través de una clasificación de complicaciones postoperatorias adaptado a cirugía ortopédica según gravedad, con ejemplos en distintos escenarios ortopédicos y subespecialidades ortopédicas, con validación inter e intraobservador.

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Abstract:

Introduction: Postoperative complications (PCs) constitute any deviation from the normal postoperative course. Reporting of PCs remains a challenge, multiple classification systems have been proposed, however these have not been validated across surgical specialties. Clavien and Dindo (DCCS) developed a system for General Surgery and has been adopted in different fields. Nonetheless, this classification has not been adapted to Orthopedics. The objective of this study was to adapt the Clavien-Dindo classification to orthopedic scenarios and to determine the intra and interobserver reliability. **Methods:** The designer team adapted the Clavien Dindo classification to orthopedic scenarios. Ten orthopedic observers with different degrees of training and experience were selected to evaluate the classification. 48 simulated clinical scenarios of complications and another negative outcomes such as failure to cure and sequelae were sent by electronic format independently. A second round of scoring was performed 30 days later to assess the intraobserver concordance. **Results:** We found a high interobserver and intraobserver reliability for both the first and second evaluation (Kappa 0.88 and 0.91, respectively). In addition, the intraobserver analysis showed a very good correlation (Kappa 0.93). **Principal conclusion:** The DCCS classification has been developed for general surgery and has been widely applied in the different surgical subspecialties. In Orthopedics, this classification was validated to hip and pediatric surgery. Therefore, our study involved an adaptation of the classification to general and specific orthopedic scenarios of the different orthopedic subspecialties. This classification may be a useful tool for documenting complications in orthopedic surgery.

Keywords: postoperative complications; orthopedics; health systems.

Resumen:

Introducción: Las complicaciones postoperatorias constituyen cualquier desviación del estado postoperatorio normal. El registro de las mismas sigue siendo un desafío, se han propuesto múltiples sistemas de clasificación, sin embargo, estos no han sido validados en todas las especialidades quirúrgicas. Clavien y Dindo desarrollaron un sistema para Cirugía General y ha sido adoptado en diferentes campos. Sin embargo, esta clasificación no se ha adaptado a la ortopedia. El objetivo de este estudio fue adaptar la clasificación de Clavien-Dindo a los escenarios ortopédicos y determinar la confiabilidad intra e interobservador. **Materiales y Métodos:** Se adaptó la clasificación de Clavien Dindo a los escenarios ortopédicos. Diez observadores con diferentes grados de entrenamiento y experiencia fueron seleccionados para evaluar la clasificación. Se enviaron 48 escenarios clínicos simulados de complicaciones y otros resultados negativos en formato electrónico de forma independiente. Se realizó una segunda ronda de puntuación 30 días después para evaluar la concordancia intraobservador. **Resultados:** Encontramos una alta confiabilidad interobservador e intraobservador tanto para la primera como para la segunda evaluación (Kappa 0.88 y 0.91, respectivamente). Además, el análisis intraobservador mostró una muy buena correlación (Kappa 0,93). **Conclusión principal:** La clasificación Clavien-Dindo se ha desarrollado para cirugía general y se ha aplicado ampliamente en las diferentes subespecialidades quirúrgicas. En ortopedia, esta clasificación fue validada para cirugías de cadera y pediátrica. Por lo tanto, nuestro estudio implicó una adaptación de la clasificación a escenarios ortopédicos generales y específicos de las diferentes subespecialidades ortopédicas. Esta clasificación puede ser una herramienta útil para documentar complicaciones en cirugía ortopédica.

Palabras clave: complicaciones posoperatorias; ortopedia; sistema de salud.

Resumo

Introdução: As complicações pós-operatórias constituem qualquer desvio do estado pós-operatório normal. O registro destes permanece um desafio, vários sistemas de classificação foram propostos, no entanto, estes não foram validados em todas as especialidades cirúrgicas. Clavien e Dindo desenvolveram um sistema para Cirurgia Geral e foram adotados em diferentes áreas. No entanto, essa classificação não foi adaptada à ortopedia. O objetivo deste estudo foi adaptar a classificação de Clavien-Dindo aos cenários ortopédicos e determinar a confiabilidade intra e interobservadores. **Materiais e Métodos:** A classificação de Clavien Dindo foi adaptada aos cenários ortopédicos. Dez observadores com diferentes graus de treinamento e experiência foram selecionados para avaliar o ranking. 48 cenários clínicos simulados de complicações e outros resultados negativos foram enviados eletronicamente de forma independente. Uma segunda rodada de pontuação foi realizada 30 dias depois para avaliar a concordância intraobservador. **Resultados:** Encontramos alta confiabilidade interobservador e intraobservador para a primeira e a segunda avaliação (Kappa 0,88 e 0,91, respectivamente). Além disso, a análise intraobservador mostrou uma correlação muito boa (Kappa 0,93). **Conclusão principal:** A classificação de Clavien-Dindo foi desenvolvida para cirurgia geral e tem sido amplamente aplicada nas diferentes subespecialidades cirúrgicas. Na ortopedia, essa classificação foi validada para cirurgias de quadril e pediatria. Portanto, nosso estudo envolveu uma adaptação da classificação a cenários ortopédicos gerais e específicos das diferentes subespecialidades ortopédicas. Essa classificação pode ser uma ferramenta útil para documentar complicações em cirurgia ortopédica.

Palavras-chave: complicações pós-operatórias; ortopedia; sistema de saúd

Introduction

The assessment of outcomes following orthopaedic surgery is of utmost importance to enhance the value of health care[1]. Therefore, reporting the outcomes and specifically postoperative complications in a standardized fashion is an important approach to determine the real quality and value of surgical interventions. Nonetheless, postoperative complications are usually underreported due to logistical issues, and partially due to the lack of an universally accepted classification system[2] as well as the absence of a clear definition of what a postoperative complication is[3].

Clavien et al.[4] introduced the first classification in cholecystectomy cases based on the main intervention required to solve any complication. Dindo et al.[5] in 2004 modified the original classification by developing a five-grade system of increasing severity (the Clavien-Dindo Classification system, DCCS), which was rapidly adapted across general surgery and multiple subspecialties[6-12]. In orthopedic surgery, the reliability of this classification was assessed and utilized only within the scope of hip preservation and pediatric orthopaedic surgery[13-14]; however, no validation in general orthopaedic scenarios has been performed. Since there is a need for a universal, specialty-oriented classification system for recording postoperative complications after orthopedic procedures, we aimed to develop and validate the use of the Clavien-Dindo Classification in orthopedic surgery

Materials and Methods

In order to adapt the new classification, a consensus was reached among the designer team through five weekly meetings, the authors constituted the designer team and agreement was reached by majority. All aspects of the classification were discussed in the meetings and disagreements were solved by consensus.

Terminology: Definition of negative outcomes

Following Dindo et al.[5] outlines, we differentiated the terms *'complication'*, 'f*ailure to cure*' and *'sequelae'* after surgical treatment. In this sense, a *complication* was defined as a deviation of postoperative course, *Failure to cure* was defined as a negative outcome not directly related to the procedure when the original purpose of the surgery is not achieved, such as a tumor recurrence after incomplete resection and *sequelae* was defined as an outcome inherently related to the procedure, such as the inability to walk after an amputation. Therefore, *failure to cure* and *sequelae* were not considered as complications.

The Clavien-Dindo classification system[5] (DCCS) (**Table 1**) was adapted to Orthopedic surgery (**Table 2**) and applied to different orthopedic scenarios (D & C-O). The adapted classification system was:

Table N°1: Classification of surgical complications according to Clavien-Dindo

Grade	Definition
I	Any deviation from the normal postoperative course without the need of pharmacological treatment (except antipyretics, anti diarrheal, antiemetic) or surgical, radioscopical intervention
II	Requiring pharmacological treatment with drugs Blood transfusion and parenteral nutrition are also included
III	Requiring endoscopic, radioscopic or surgical treatment Without general anesthesia (IIIA) With general anesthesia (IIIB)
IV	Life-threatening complication requiring ICU management Single-organ dysfunction (IV A) Multi-organ dysfunction (IV B)
V	Death

Table N° 2: Adapted classification of surgical complications to orthopedic surgery

Grade	Definition
I	Non-life-threatening complication that requires transient medication and resolves within the next 72 h.
II	Requiring pharmacological intervention for at least 72 h, or Active observation without interventions. -Non-scheduled blood transfusion is also considered -Transient neurological deficit that requires physical therapy with complete recovery -Careful observation of hematoma or seroma
III	Requiring endoscopic, radioscopic or surgical treatment -Outside the OR, without or with local anesthesia (IIIA) -In the OR, with regional or general anesthesia (IIIB)
IV	-Life-threatening complication requiring ICU management -Permanent, not expected, nerve deficit without recovery
V	Death

M suffix: Medical

S suffix: Surgical

T: Transient functional deficit/disability

P: Permanent functional deficit/disability

Grade I: Non-Life-threatening complication that requires transient medication or non-surgical intervention that resolves within the first 72 h.

Nausea and vomiting, diarrhea, constipation (constipation secondary to opioid derivatives should be considered as a side effect and not a postoperative complication), urinary retention, fever that requires antipyretics, Superficial phlebitis.

Grade II: Non-Life-threatening complication that requires medication for at least 72 h. Superficial wound infection, urinary infection, pneumonia, pseudomembranous colitis, anemia that requires non-scheduled blood transfusion (**Table 3**). Deep vein thrombosis that requires anticoagulation therapy, pulmonary embolism without the need of ICU management are also considered in this group.

Table N° 3: Blood transfusion in Orthopedic Surgery*

	Procedure	
Region	**Scheduled transfusion**	**Unscheduled transfusion**
Spine	-Two or more level spinal fusion -En bloc resection -Pedicle subtraction osteotomy -Double thoracic/lumbar approach -Fusion revision surgery	-One-level spinal fusion -Laminectomy -Laminoplasty -Microdiscectomy -Non-fusion revision surgery -Vertebroplasty/Kyphoplasty
Hip	-Revision of total hip replacement -Complex primary total hip replacement -Periacetabular osteotomy or similar	-Primary total hip replacement -Hip arthroscopy -Surgical hip dislocation -Mini-open impingement surgery
Knee	-Revision of total knee replacement -Complex primary total knee replacement	-Primary total Knee replacement -Tibial or femoral osteotomy
Oncology	- Extremities en bloc resections - Pelvic resections (en bloq and intralesional resections) -Renal metastasis resection. -Metastatic Pathologic fractures -Extensive curettage for aggressive benign tumours -Deep soft tissue sarcomas resections (>10 cm)	- Benign bone tumour resection (osteochondromas, enchondroma) -Superficial soft tissue tumour resections - Deep soft tissue sarcomas resections (<5 cm) -Prophylactic endomedular stabilization.
Pediatric	-Scoliosis -Open Reduction and Internal Fixation (ORIF) of femoral or pelvic fractures	- Most of ORIF except for femoral or pelvic fractures
Trauma	-Open reduction and internal fixation of Femoral and pelvic/acetabulum fractures -Lower and upper knee amputation	-ORIF: Tibial/ankle fractures -ORIF: Upper limb fractures
Upper limb	-Free flaps	-ORIF: Humeral, radial cubital fractures
Foot/Ankle	-Free flaps	-ORIF: Ankle/Tarsal/Metatarsal fractures -Ankle arthrodesis -Ankle/Midfoot amputation

* Blood transfusion in orthopaedics should be considered as a complication when there is a low risk of bleeding from surgery or the estimated risk of bleeding is low and the transfusion is not a planned event, several factors influence the need of a blood transfusion such as the previous hemoglobin level, surgical length, age and type of surgical intervention. In times in which tranexamic acid is used in most of orthopaedic procedures, some surgeries, such as primary total hip and knee replacement that used to require postoperative blood transfusions are nowadays not expected to receive it. Major surgeries such as posterior spinal fusion in deformity, major tumoral resection, revision hip or knee surgery or any procedure in which the risk of bleeding is high and the probability of intraoperative or postoperative transfusion is higher than 50% should not be considered as a complication because it is usually planned before the procedure. On the other hand, procedures in which blood transfusions are not expected, the need of any blood cell derivative transfusion should be considered a postoperative complication.

Transient motor functional deficit such as postoperative paresis/paralysis, that usually requires physical therapy with complete recovery is considered a transient Grade II complication (Grade II-T). Motor deficit as a result of unplanned direct or indirect nerve injury are considered Grade II when complete recovery is observed. Permanent functional deficit is considered a permanent Grade IV complication (Grade IV-P). Expected functional deficit from planned nerve injury such as section of nerve root in tumoral resection surgery is considered *sequelae* and not a complication.

Grade III: Postoperative complications that require radioscopic or surgical intervention are considered in this group.

IIIA are considered complications that require a percutaneous or even closed intervention than can be performed with local anesthesia or even without anesthesia and are resolved in the outpatient's clinic or in the x-ray room. Procedures that require regional or general anesthesia and are performed in the operating room (OR) are considered Grade IIIB. Postoperative mobilization secondary to limb

rigidity, generally observed in shoulder or knee surgery are considered Grade IIIB when it is performed in the OR regardless the type of anesthesia. In addition, prosthesis dislocation that requires reduction is considered in this group due to the need of an intervention. In some cases reduction can be performed radioscopically with general or regional anesthesia in the OR (IIIB) or without anesthesia in the radioscopy room, being considered IIIA.

Grade IV: Postoperative complication that requires ICU management are considered in this group.
Myocardial infarction, pulmonary embolism that require ICU management.
Permanent functional deficit is considered in this group (Grade IV P).

Grade V: *Death*

Evaluation of the agreement of Dindo Clavien system in orthopedics

Mean clinical examples of complications in different orthopedic scenarios are summarized in **Table 4**. In order to evaluate the reliability of Dindo Clavien system in orthopedic surgery we identified 10 readers to evaluate 48 orthopedic surgical scenarios each one related to postoperative complications or control scenarios. The readers were not involved in the development of this classification. The scenarios were developed by the designer team and were performed as follows: 6 grade I cases, 9 grade II, 5 grade IIIA, 9 grade IIIB, 9 grade IV, 5 grade V and 5 cases with negative outcomes that are not a complication, instead, a sequelae or failure to cure. The observers were chosen from different stages of training: 1 PGY5 resident, 2 chiefs residents – PGY6 and 7 orthopedic surgery fellowship trained staff.

Table N°4: Clinical examples of complication grades in orthopedics

Grades	Region/Organ/ System	Examples
Grade I	Gastrointestinal	-Nausea/Vomiting/Diarrhea that requires transient medication
	Limb	-Superficial phlebitis treated with ice
	Hip/Knee	
Grade II	Spine/Limb/ oncology	-Postoperative paralysis that resolves with completely
		-Superficial wound infection that requires antibiotics
	Hip/Knee	-Postoperative rigidity that requires physical therapy
		-Transient neuropraxia related to retractor positioning.
		-Delayed union following femoral or trochanteric osteotomy.
		-Brooker I-II heterotopic ossification; wound complication that does not require treatment
Grade IIIA	Hip/knee	-Prosthetic Hip dislocation that requires reduction without anesthesia
		-Deep vein thrombosis
	Spine/Limb/ oncology	-Knee stiffness not requiring manipulation under anaesthesia (MUA)
		-Abscess that requires percutaneous drainage without anesthesia or with local anesthesia
		-Wound dehiscence that can be resolved with local anesthesia (Hand/Foot surgery)
Grade IIIB	Knee/Shoulder	-Prosthetic dislocation that require reduction under regional or general anesthesia
	Spine/Limb/Oncology	-Wound infection that requires surgical debridement with regional or general anesthesia
		-CSF fistula that requires reoperation
		-Screw removal/relocation due to soft tissue irritation
		-Wound dehiscence that require general anesthesia (Spine/Oncology surgery)
	Hip/Knee	-Compartment syndrome treated with fasciotomy with complete motor recovery
		-Non-union of the femoral/trochanteric osteotomy that require reoperation
		-Early implant loosening
		-Brooker III-IV heterotopic ossification requiring surgical treatment
		-Implant failure that requires revision surgery
		-Periprosthetic/peri-implant fracture, including cortical perforations.
		-Joint stiffness requiring manipulation under anesthesia (MUA).
		-Polyethylene dissociation or polyethylene dislocation following total or unicompartmental knee arthroplasty.
		-Avascular necrosis following hip preservation surgery that requires reoperation
Grade IV	Spine/Limb	-Postoperative paralysis from nerve injury without recovery
	Cardiac	-Compartment syndrome treated with fasciotomy with postoperative Volkmann contracture
	Respiratory	-Myocardial infarction that requires ICU management
		-Pulmonary embolism that requires ICU management
	Hip/Knee	-Permanent vascular/neurological injury
Grade V	-	-Death

The clinical scenarios were sent to the observers by email, all readers had access to the classification scheme while grading. The readers sent their conclusion about the grade selected to the coordinating center for evaluation by the authors.
The graded data were collected and analyzed for reliability, the interobserver agreements
were assessed for each grade of the complication.

Ethics consideration

The study protocol (Protocol number 5000, IRB00010193) was approved by the ethic review board from Hospital Italiano de Buenos Aires in concordance with Helsinki declaration.

Statistical analysis

Evaluation of the inter-rater agreement

In a first step we evaluated the interobserver agreement through the calculation of the weighted Kappa coefficient for each pair of judges (Readers).
The classification categories of Clavien and Dindo adapted for orthopedics (D & C-O) were prepared as an ordinal variable represented with numerical values from 0 to 6 (0: absence of complications, 1: grade 1, 2: grade 2, 3: grade 3a, 4: grade 3b, 5: grade 4, 6: grade 5)
The authors assigned a point to the perfect agreement between each pair of readers, defined as the situation in which both readers assigned exactly the same grade of D & C-O classification to the clinical scenario in question. When both readers had a disagreement of more than one category, it was represented by a value of zero. When the disagreement was of only one category of difference (e.g., the same case was evaluated as corresponding to grade 2 of the classification by a judge and to grade 1 by the other reader), the authors agreed on an intermediate penalty represented by 0,5 or 0,75 points according to the case. A minimal penalty was applied to the close disagreements of low clinical relevance, representing their degree of agreement with a value of 0.75 and those of greater clinical relevance were given an intermediate penalty, representing their agreement with a value of 0.5.
In addition, according to Koo and col.[15] we also calculated the intraclass correlation coefficient (ICC) through a two-way random-effects model and decided to communicate in this manuscript the most conservative ICC (the one corresponding to the real-life application of this type of coding by a single evaluator).

Evaluation of the degree of intra-evaluator agreement

To evaluate the degree of intra-evaluator agreement (test-retest), we calculated the weighted Kappa coefficient according to the same weighting matrix as for the degree of agreement between the different evaluators.

Results

Interobserver reliability according to grades is observed in **table 5** with high interobserver reliability in both, first and second reading (0.88 and 0.91, respectively). Intraobserver reliability showed also high correlation among readers (0.9793) (**see table 6**).
The ICC that represents the degree of absolute agreement between different evaluators, calculated through a two-way random effects model was 0.86 (95% CI 0.81 to 0.91).

Table N° 5: Interobserver reliability based according to complication grades

Complication grade	First reading Fleiss' *K* (95% CI)	Second reading Fleiss' *K* (95% CI)
CD grade 1	0.9365 (0.9225-0.9505)	0.9792 (0.9652-0.9932)
CD grade 2	0.8681 (0.8541-0.8821)	0.8411 (0.8271-0.8551)
CD grade 3A	0.9181(0.9041-0.9321)	0.9747 (0.9607-0.9887)
CD grade 3B	0.8752 (0.8012-0.8892)	0.9314 (0.9174-0.9454)
CD grade 4	0.9701 (0.9561-0.9841)	0.9531 (0.9211-0.9671)
CD grade 5	0.9499 (0.9359-0.9639)	0.9747 (0.9607-0.9887)
It is not a complication	0.6773 (0.6633-0.6913)	0.8032 (0.7892-0.8172)
Overall	0.8877 (0.8737-0.9017)	0.9181 (0.9041-0.9321)

Table N° 6: Cohen's *K* for Intraobserver reliability

Observer	Cohen's K	Upper bound, 95% CI	Lower bound, 95% CI
1	0.9293	1.07	0.78
2	0.9152	1.05	0.77
3	0.9127	1.05	0.77
4	0.9262	1.07	0.77
5	0.935	1.07	0.79
6	0.9575	1.09	0.81
7	0.9712	1.11	0.82
8	0.9432	1.08	0.80
9	0.9562	1.10	0.81
10	0.9274	1.07	0.78
Overall	0.9374	1.08	0.79

Discussion

A comprehensive, reliable and standardized classification system is necessary to record complications after orthopaedic surgery in order to allow quality and research endeavors. Therefore, this study introduced a modification of a validated classification system developed by Clavien et al[5], which was initially utilized in abdominal surgery but rapidly extended to other subspecialties. As in multiple areas of medicine, in orthopedic surgery the reporting of postoperative complications is not homogeneous and is limited by the absence of a standardized system, making comparison of outcomes among different studies unreliable[3]. In addition, terms such as 'minor', 'moderate' and 'severe' are considered as subjective and rottenly biased[16-17], inevitably leading to misinterpretation and acting as confounding factors[7].

Sink et al.[18] applied the Clavien-Dindo classification system to evaluate complications after surgical hip dislocation. Subsequently, the same authors adapted this scheme to hip preservation surgery achieving a high interobserver and intraobserver reliability[13]. In their adapted system; grades 3A/B and 4A/B were replaced for grade 3 and 4. This new adapted classification was recently applied in pediatric orthopaedic surgery with a good interrater reliability[14]. Based on Sink et al.'s study, we aimed to develop a new adaptation of the Clavien-Dindo system that could be applicable in every orthopedic scenario.

We found a high interobserver and intraobserver reliability when rating simulated scenarios of postoperative complications with the new adapted scheme. Additionally, we also included five scenarios in which there were no complications, introducing scenarios of sequelae and failure to cure, to assess a better understanding of what a complication entails. In our study, complications from a variety of scenarios were developed trying to encompass all orthopedic subspecialties, from pediatric orthopedic surgery to oncology and spine.

The original classification of Clavien-Dindo was previously used at our institution by some of the authors of this manuscript[19-20], resulting useful in terms for showing the prevalence of complications; however, several limitations were found, mainly because the majority of scenarios were developed for abdominal surgery being difficult to extrapolate to certain orthopedic settings.

Bellut et al[21] applied the Clavien-Dindo classification scheme to lumbar spine surgery observing a direct correlation between outcome scales, hospital length of stay and complication grades. When developing this variation of the classification, there was consensus regarding the need to address blood transfusion in orthopedic procedures differently from what it had been reported previously for general surgery. Hence, we decided to differentiate a scheduled blood transfusion from an unscheduled one, stating that the need of blood transfusion should be considered a complication only when it is not part of the preoperative planning. Therefore, surgeries in which the probability of blood transfusion is higher than 50%, such us multilevel spine fusions[22-23], should not be considered a complication.

Other important topic regarding the adaptation of this classification was the need to address nerve (motor or sensitive) deficit carefully. In this regard, we decided, similarly to Sink et al.[13], to consider that a transient, not planned, nerve deficit that recovers should be categorized as a grade II, whereas a permanent, not planned, nerve deficit should be considered as grade IV.

This study is not without limitations. First, the design of the study relied on artificial clinical scenarios which were not taken from a database; instead, they were created by the authors based on personal experiences of common complications in the different subspecialties; this could overestimate the inter rater reliability, however, all clinical scenarios are possible evolutions from the postoperative course and therefore can be present in the current practice. As an important strength of this study we mention the different observer expertise, ranging from advanced residents to experienced orthopedic surgeons, making the results more applicable among different background orthopedic specialist.

Conclusion

The hereby presented modified classification system for postoperative complication in orthopedic surgery can potentially aid institutions and surgeons to registry and track the rate of postoperative complications, allowing research and quality endeavors. Such approach would allow the development of evidence-based strategies to decrease postoperative complication rates.

Conflict of Interest Statement
Each author certifies that he or she has no commercial associations that might pose a conflict of interest in connection with the submitted article.

Limitaciones de responsabilidad
Somos responsables de la no difusión de datos de pacientes para preservar sus identidades.

Fuentes de apoyo
No contamos con fuentes de apoyo.

Originalidad del trabajo
Este trabajo es original del servicio de Ortopedia y Traumatologia del Hospital Italiano de Buenos Aires

Cesión de derechos
Cedemos los derechos de autor a la Universidad Nacional de Cordoba para publicar en la Revista de la Facultad de Ciencias Medicas.

Conflicto de intereses
Todos los autores declaran que no existe conflicto de intereses con respecto a la publicación de este documento.

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