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Salud y Desarrollo en los Trópicos

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Úlceras por presión:

Una epidemia prevenible en el contexto de una práctica asistencial segura

Presentada por **Leticia Nieto García** para optar al

Grado de Doctor por la Universidad de Salamanca

Directoras de Tesis

Dra. Montserrat Alonso Sardón

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PROGRAMA DE DOCTORADO EN SALUD Y DESARROLLO EN LOS TRÓPICOS

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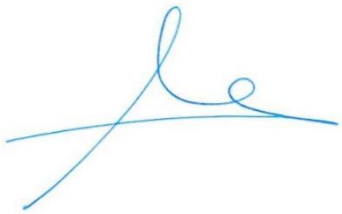
Las directoras de la Tesis Doctoral titulada *"Úlceras por presión: una epidemia prevenible en el contexto de una práctica asistencial segura"*, elaborada por la doctoranda **Dña. Leticia Nieto García**, autorizan la presentación de esta Tesis en la modalidad de *compendio de artículos*.

En Salamanca, a 17 de Junio del 2022



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Dra. Montserrat Alonso Sardón, Profesora Contratada Doctora del Departamento de Ciencias Biomédicas y del Diagnóstico, Área de Medicina Preventiva y Salud Pública, Universidad de Salamanca; y la **Dra. Adela Carpio Pérez**, Profesora Asociada de Ciencias de la Salud del Departamento de Medicina, Universidad de Salamanca, y Especialista en Medicina Interna del Servicio de Medicina Interna del Complejo Asistencial Universitario de Salamanca.

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Que la Tesis Doctoral realizada bajo nuestra dirección por **Dña. Leticia Nieto García**, con el título: *"Úlceras por presión: una epidemia prevenible en el contexto de una práctica asistencial segura"*, reúne los requisitos de calidad, originalidad y presentación exigibles a una investigación científica, y está en condiciones de ser sometida a la valoración del Tribunal encargado de juzgarla en la modalidad de *Tesis por compendio de publicaciones* para optar al GRADO DE DOCTOR por la Universidad de Salamanca.

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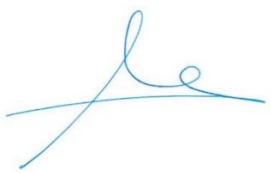

Fdo. Montserrat Alonso Sardón

Fdo. Adela Carpio Pérez

La presente Tesis Doctoral titulada "*Úlceras por presión: una epidemia prevenible en el contexto de una práctica asistencial segura*" realizada por Dña. Leticia Nieto García, bajo la dirección de la Dra. Montserrat Alonso Sardón y Dra. Adela Carpio Pérez, corresponde a un compendio de artículos originales publicados en revistas científicas de prestigio internacional e indexadas en el *Science Citation Reports*, cuyos datos bibliométricos se detallan en el **Anexo I**.

A continuación, se describen los cuatro artículos originales de investigación, su título, afiliaciones y autores de los mismos, junto la referencia completa de la revista científica donde fueron publicados:

ARTÍCULO PRIMERO

Título: Can an early mobilisation programme prevent hospital-acquired pressure injures in an intensive care unit?: A systematic review and meta-analysis.

Autores: Nieto-García L[1], Carpio-Pérez A[2,3], Moreiro-Barroso MT[3], Alonso-Sardón M[4].

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Revista: International Wound Journal.

Referencia completa: Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Alonso-Sardón M. Can an early mobilisation programme prevent hospital-acquired pressure injures in an intensive care unit?: A systematic review and meta-analysis. Int Wound J. 2021;18:209-220. https://doi.org/10.1111/iwj.13516

ARTÍCULO SEGUNDO

TÍtulo: Clinical Burden of Inpatient Wound Care in Internal Medicine Units During the First Wave of COVID-19 Outbreak.

Autores: Nieto-García L[1], Carpio-Pérez A[2], Moreiro-Barroso MT[3], Ruíz-Antúnez E[4], Nieto-García A[5], Alonso-Sardón M[6].

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Revista: Advance in Skin & Wound Care.

Referencia completa: Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Ruíz-Antúnez E, Nieto-García A, Alonso-Sardón M. Clinical Burden of Inpatient Wound Care in Internal Medicine Units During the First Wave of COVID-19 Outbreak. Adv Skin Wound Care. 2022 Jun 30. doi: 10.1097/01.ASW.0000824564.25976.c8.

ARTÍCULO TERCERO

Título: Are there differences between COVID-19 and non-COVID-19 inpatient pressure injuries? Experiences in Internal Medicine Units.

Autores: Nieto-García L[1], Carpio-Pérez A[2], Moreiro-Barroso MT[3], Ruiz-Antúnez E[4], Nieto-García A[1], Alonso-Sardón M[5].

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Revista: PLoS One.

Referencia completa: Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Ruiz-Antúnez E, Nieto-García A, Alonso-Sardón M. Are there differences between COVID-19 and non-COVID-19 inpatient pressure injuries? Experiences in Internal Medicine Units. PLoS One. 2022 Feb 17;17(2):e0263900. doi: 10.1371/journal.pone.0263900.

ARTÍCULO CUARTO

Título: Is the increase in skin wounds in hospitalized patients in Internal Medicine Units a side effect of the COVID-19 pandemic?

Autores: Nieto-García L[1], Carpio-Pérez A[2], Moreiro-Barroso MT[3], Rubio-Gil FJ[4], Ruiz-Antúnez E[5], Nieto-García A[6], Alonso-Sardón M[7].

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Revista: Enviado a la revista European Journal of Internal Medicine, pendiente de aceptación.

A mis padres, Ainhoa y Roberto.

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En primer lugar, quisiera dar mi agradecimiento a las directoras de este proyecto de Tesis de Doctoral. A la Dra. Montserrat Alonso, por todo lo que me has enseñado y por toda la implicación y trabajo que has dedicado a esta tesis. Siempre estaré agradecida de que me acogieras en mis inicios en la investigación y me hayas acompañado en cada etapa de este camino. A la Dra. Adela, por estar ahí siempre que la he necesitado y por su perspectiva tan humanizada en el cuidado de los pacientes. A ambas os agradezco todo vuestro esfuerzo, vuestra calidez y animo continuo durante estos cuatros años.

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A todos, muchas gracias.

Abreviaturas

APEAS: Estudio sobre la seguridad de los pacientes en Atención Primaria.

CAUSA: Complejo Asistencial Universitario de Salamanca.

EA: Efecto adverso.

ENEAS: Estudio Nacional sobre los efectos adversos ligados a la hospitalización.

ENOJA: Evento nunca o jamás.

EPUAP: European Pressure Ulcer Advisory Panel.

GNEAUPP: Grupo Nacional para el Estudio y Asesoramiento en Úlceras por Presión y Heridas Crónicas.

IC: Intervalo de Confianza.

LCRD: Lesiones cutáneas relacionadas con la dependencia.

LESCAH: Lesiones Cutáneas Asociadas a la Humedad.

LPP: Lesión por presión.

MDRPI: Medical device-related pressure injury.

NPUAP/NPIAP: National Pressure Ulcer/Injury Advisory Panel.

OMS: Organización Mundial de la Salud.

SEMP: Superficie Especial de Manejo de Presión.

UCI: Unidad de Cuidados Intensivos.

Índice

INTRODUCCIÓN

CONTEXTUALIZACIÓN DEL TEMA

En la actual "cultura de la seguridad", las lesiones por presión (LPP) continúan siendo un elemento clave en la monitorización de la calidad asistencial. Siendo uno de los eventos adversos más frecuentes dentro de los cuidados de salud y dado su alto porcentaje de casos/episodios potencialmente evitables, la implementación de medidas preventivas se considera un requisito obligado en todos los protocolos de cuidados tanto en entornos de agudos como en crónicos.

La autora Pam Hibbs describía la situación epidemiológica de las úlceras por presión como una “epidemia bajo las sábanas” hace ya más de tres décadas. Si bien es cierto que diferentes estudios han mostrado una tendencia general de descenso en sus cifras de incidencia, se continúan observando tasas de prevalencia significativas, aunque muy variables entre los diferentes países y entornos asistenciales, incluso entre los propios servicios sanitarios de un mismo complejo asistencial. A pesar de que su presencia clásicamente se ha considerado como un “problema secundario”, sobre todo en pacientes hospitalizados, es indiscutible su asociación con un aumento de la morbilidad, la mortalidad y la duración de la estancia hospitalaria y, por tanto, supone una repercusión económica importante.

El análisis de la evolución de la situación epidemiológica desde una evidencia científica constituye una base imprescindible en la investigación sobre este problema de salud pública, ya que nos permite optimizar la gestión de las medidas de prevención y analizar las posibles barreras o dificultades en su implementación, la instauración precoz de posibles déficits y/o mejoras detectadas en el proceso de atención al paciente y la capacidad de adaptación del sistema de salud ante situaciones de sobrecarga asistencial como la vivida tras la pandemia por el nuevo coronavirus SARS-CoV-2.

MARCO TEÓRICO

1. Lesiones por presión: Definición

Las LPP se engloban dentro de las heridas crónicas, junto con otros tipos etiológicos de lesiones cutáneas como las úlceras vasculares (arteriales y venosas) y las úlceras del pie diabético. Clásicamente, las heridas crónicas han sido definidas como aquella pérdida de continuidad de la superficie epitelial que no logra proceder a través de un proceso ordenado y oportuno de cicatrización para alcanzar la integridad anatómica y funcional [1]. El propio término da a entender que se trata de un proceso que requiere para su curación de periodos muy prolongados, aunque la literatura no aporta un consenso claro del tiempo necesario para determinar su cronicidad, algunos autores utilizan como marco temporal límite aproximadamente las seis semanas de evolución [2].

En 2016 el *National Pressure Ulcer Advisory Panel* (NPUAP) [3] redefine la conceptualización de "úlcera por presión" al introducir el término de lesión (en inglés *injury*) en vez de úlcera (*ulcer*) debido a que, como indican los propios autores, una úlcera no puede estar presente sin una lesión, pero una lesión puede estar presente sin una úlcera. Además, el término úlcera no describe con exactitud una lesión en estadio 1 o una lesión por presión del tejido profundo (en inglés *Deep Tissue Pressure Injury*, DTPI). Dicho término también fue aceptado por el Grupo Nacional para el Estudio y Asesoramiento en Úlceras por Presión y Heridas Crónicas (GNEAUPP) en España.

El mismo documento de la NPUAP aporta como la definición más actualizada de LPP:

> *"Aquel daño localizado en la piel y los tejidos blandos subyacentes, generalmente sobre una prominencia ósea o relacionado con un dispositivo médico o de otro tipo. La lesión puede presentarse como una piel intacta o una úlcera abierta y puede ser dolorosa. La lesión se produce como resultado de una presión intensa y/o prolongada o de una presión combinada con cizallamiento. La tolerancia de los tejidos blandos a la presión y al cizallamiento también puede verse afectada por el microclima, la nutrición, la perfusión, el estado de comorbilidad y el estado de los tejidos blandos"* [3].

Al mismo tiempo que evoluciona dicha definición ha surgido un nuevo marco teórico desarrollado por García-Fernández et al [4] que clasifica las lesiones cutáneas

relacionadas con la dependencia (LCRD) en función de su mecanismo de producción en: LPP, lesiones por humedad, lesiones por fricción y lesiones combinadas. De este modo, se pretende facilitar la correcta identificación de la lesión para que contribuya tanto en la investigación epidemiológica como en el avance del estudio de la aplicación adecuada de medidas preventivas y su tratamiento. Debido a la frecuente confusión entre los términos LPP y Lesiones Cutáneas Asociadas a la Humedad (LESCAH), conocidas en inglés como "*Moisture-associated skin damage*" (MASD), se ha publicado recientemente un documento clínico [5] que permite facilitar la comprensión y las diferencias entre dichas categorías. El propio grupo GNEAUPP propone definir las LESCAH como:

> *"La lesión localizada en la piel (no suele afectar a tejidos subyacentes) que se presenta como una inflamación (eritema) y/o erosión de la misma, causada por la exposición prolongada (continua o casi continua) a diversas fuentes de humedad con potencial irritativo para la piel (por ejemplo: orina, heces, exudados de heridas, efluentes de estomas o fistulas, sudor, saliva o moco)"* [5].

Dentro de la categoría LESCAH se engloban las siguientes entidades clínicas: dermatitis asociada a la incontinencia, dermatitis intertriginosa o por transpiración, dermatitis perilesional asociada al exudado, dermatitis cutánea asociada al exudado, dermatitis periestomal y dermatitis por saliva o mucosidad [6]. Por último, consideramos interesante señalar que los estudios publicados sobre este tema sugieren que las LESCAH pueden incrementar el riesgo a desarrollar LPP [4,7].

Una codificación estructurada es necesaria para mejorar la precisión del diagnóstico y reducir la clasificación errónea de LPP. Para facilitar la correcta categorización la Clasificación Internacional de Enfermedades (CIE) en su última edición, CIE-10, desarrolla en el capítulo 12 denominado "Enfermedades de la piel y del tejido subcutáneo", los códigos L89 - Úlcera por presión y L97 - Úlcera crónica no debida a presión de extremidad inferior; ambos permiten identificar la localización, la lateralidad y el estadio/gravedad de la lesión.

2. LPP en el contexto de seguridad del paciente

Las LPP continúan siendo un problema sociosanitario que no ha decrecido en los últimos años a pesar de los numerosos estudios publicados sobre su repercusión en el deterioro de la calidad de vida y su asociación con un aumento de la carga asistencial y

económica. Si bien es cierto que el aumento de la prevalencia de enfermedades no transmisibles y el envejecimiento de la población han puesto en relieve la importancia del cuidado de las heridas, situaciones de sobrecarga asistencial como la vivida tras la pandemia por la COVID-19 requieren recentrar la atención sobre la capacidad de adaptación de los protocolos de prevención de LPP establecidos por cada centro ante situaciones de emergencia sanitaria.

Desde el punto de vista de la seguridad del paciente, las LPP son consideradas un efecto adverso (EA) del sistema sanitario, principalmente debido a que son evitables en un porcentaje elevado de los casos al aplicar de forma precoz las directrices internacionales de la práctica clínica recomendadas en su prevención. Se debe señalar no solo su carácter prevenible sino su asociación con repercusiones negativas para el paciente (por ejemplo, dolor, aumento de las tasas de infección, morbilidad y mortalidad) y del sistema sanitario (aumento de la estancia hospitalaria y de los costes financieros) [8-10].

En concreto, se entiende como EA la lesión o complicación, derivada de la asistencia sanitaria y no de la enfermedad de base del paciente, que prolonga la estancia hospitalaria, que precisa de procedimientos diagnósticos o tratamiento adicional o que esté relacionado con exitus o incapacidad al alta [11]. No obstante, el autor Torra i Bou et al proponen el uso del acrónimo ENOJA (Evento Nunca o Jamás) para aquellos "eventos que nunca debían haber ocurrido", y que el *National Health Service* (Sistema Nacional de Salud) británico define como:

> *"aquellos incidentes en la seguridad del paciente, graves y ampliamente prevenibles, que no deberían ocurrir nunca si las medidas preventivas existentes han sido implementadas por los profesionales de la salud*" [12].

Dentro del listado de eventos graves de declaración obligatoria, encontramos los eventos relacionados con la realización de los cuidados, y en ellos, tenemos las "úlceras por presión" desarrolladas tras el ingreso del paciente en una institución sanitaria. En los principales estudios de los EA en España, los estudios ENEAS [11] (Estudio Nacional sobre los efectos adversos ligados a la hospitalización) y APEAS [13] (Estudio sobre la seguridad de los pacientes en Atención Primaria) las LPP aparecen como primera causa de EA dentro del grupo de EA relacionados con los cuidados en ambos estudios.

La seguridad del paciente, componente clave de la calidad asistencial, ha sido abordada dada su relevancia por las principales organizaciones de la salud como la Organización Mundial de la Salud (OMS), la Organización Panamericana de la Salud, así como diversas agencias internacionales mediante el desarrollo de estrategias para proponer planes, acciones y medidas legislativas que permitan controlar los EA evitables en la práctica clínica. Según la propia OMS, se entiende seguridad del paciente como el conjunto de actuaciones orientadas a evitar, prevenir o minimizar el daño producido como resultado de los cuidados prestados [14].

Según Torra-Bou et al [15], a diferencia de otros países en Europa, la consideración de las LPP dentro de la Estrategia de Seguridad del Paciente del Ministerio de Sanidad y Consumo de España para los años 2015-2020 es insuficiente, tanto a nivel de definición como a nivel de objetivos, cuya consecución ha sido incompleta y muy desigual entre las diferentes regiones del ámbito nacional [16]. Según recoge dicha Estrategia en el objetivo 2.4 (“Promover la implantación de prácticas seguras en los cuidados de los pacientes”) dentro de las recomendaciones se encuentra el desarrollo de un plan de cuidados individualizados que haga referencia a la prevención de úlceras por presión, entre otros aspectos relevantes.

Teniendo en cuenta que actualmente la asistencia sanitaria se basa en una “cultura de seguridad” se hace necesario continuar utilizando la ausencia/presencia de LPP como indicador de evaluación de la calidad de los cuidados; de esta manera se podrá alcanzar una mejora continua de las medidas preventivas y de los diferentes tratamientos en base a un aprendizaje a partir de los déficits del sistema sanitario.

3. Factores de riesgo de las LPP

El conocimiento de los factores de riesgo que pueden incrementar el riesgo en el desarrollo de LPP o que pueden complicar su evolución es necesario para poder aplicar las medidas preventivas que minimicen su repercusión clínica.

Las morbilidades más frecuentemente vinculadas a las heridas crónicas son: diabetes, neuropatía, enfermedad vascular, nefropatía y otras patologías (EPOC, lesiones de medula espinal, estado inmunológico deprimido, pacientes oncológicos, etc.) [17].

Aunque existen pequeñas diferencias entre aquellos artículos que analizan factores de riesgo relacionados con LPP, la literatura coincide en que suelen presentar un origen

multifactorial. El marco conceptual de factores de riesgo en el desarrollo de la LPP de Coleman et al [18] es el más conocido, ya que se encuentra respaldado por los comités de la NPIAP y EPUAP. Este marco clasifica en factores de riesgo directos, indirectos y otros factores posibles de riesgo indirecto.

- Los factores de riesgo directos son la inmovilidad, el estado de la piel y la mala perfusión.
- Los factores indirectos son la humedad, la percepción sensorial, la diabetes, la baja albumina y la mala nutrición.
- Otros posibles factores indirectos son la edad avanzada, los medicamentos, el edema con fóvea y otros factores relacionados con el estado de salud general, como la infección, la enfermedad aguda, el aumento de la temperatura corporal y las heridas crónicas.

Sin embargo, la mayoría de las guías de práctica clínica dividen los factores de riesgo en intrínsecos (aquellos relacionados con el estado de salud del paciente) y extrínsecos (aquellos relacionados con el entorno asistencial o de cuidados) [19,20]. En cuanto a los factores predisponentes extrínsecos debemos destacar la fricción, humedad, uso de dispositivos médicos (sondajes, fijaciones, férulas, etc.), superficies de apoyo inadecuadas; mientras que los factores intrínsecos se refieren a la edad avanzada, déficits sensoriales y motores, alteración de la movilidad, la incontinencia (fecal, urinaria o mixta), alteraciones nutricionales y metabólicas, determinados fármacos, etc.

En los últimos años existen tres revisiones sistemáticas, todas publicadas en el 2017 [21-23], que analizan los factores de riesgo de desarrollo de LPP específicos en Unidades de Cuidados Intensivos (UCI) y que incluyen entre otras variables, la edad, duración de la estancia en UCI, diabetes, pobre perfusión, ventilación mecánica, tiempo de ventilación mecánica, hemodiálisis intermitente o terapia de hemofiltración continua, vasopresores, sedación y alteración de la movilidad.

Dentro del contexto clínico de nuestro trabajo si hablamos de factores de riesgo extrínsecos específicos de este periodo pandémico debemos añadir otros factores que también han podido contribuir en el aumento del desarrollo de LPP u otras LCRD. La aparición de la enfermedad COVID-19 y su rápida expansión a nivel internacional supuso, no solo en España sino en gran parte de los países afectados, una presión asistencial máxima sobre el sistema sanitario, sobre todo durante los picos de las primeras olas, con un flujo elevado de hospitalizaciones, transformación de servicios en unidades COVID, creación de UCIs improvisadas, aislamiento respiratorio, falta de

recursos humanos y materiales, además de la falta de miembros de la familia en el cuidado (debido a la prohibición de acompañamiento salvo casos excepcionales).

Por otro lado, el paciente con diagnóstico de COVID-19 engloba los factores de riesgo clásicos asociados a una hospitalización además de aquellos que se presentan en UCI, debido a que un porcentaje elevado requirió la necesidad de ventilación mecánica y presentó estancias prolongadas en UCI. Por supuesto, debemos destacar también el uso del decúbito prono como terapia postural utilizada con el objetivo de mejorar la función respiratoria en los pacientes con distrés respiratorio relacionado con la enfermedad COVID-19 [24]. Se observó en el año pasado un incremento en los estudios que investigan la presencia de LPP asociadas a dicha postura, sus factores asociados y las diferentes alternativas en su prevención. Por ejemplo, un artículo español desarrolló un estudio de casos y controles en pacientes COVID-19 con el objetivo de analizar las características de las LPP asociadas a posición prona; sus resultados muestran como localización más frecuente la cara y asocian como principales factores de riesgo el número total de días en pronación y posición prona mantenida durante más de 24 horas [25]. Resultados similares se encuentran en otro artículo publicado por Capasso et al [26] donde también se analizan factores de riesgo característicos del paciente COVID-19 en cuidados críticos.

4. Prevención de LPP

El mejor tratamiento de las LPP es su propia prevención, por lo que es necesario disponer de estrategias integradas en la práctica clínica asistencial.

Los pasos para la prevención de LPP han sido definidos por la NIPIAP en una herramienta terapéutica multimodal que incluye la implementación de evaluación de riesgo de desarrollo; inspección de la piel; intervenciones nutricionales, diagnósticas y terapéuticas; cambios posturales y movilización del paciente; y estrategias de educación del paciente y la familia [27]. Este tipo de programas de intervención múltiple han mostrado un impacto positivo en la disminución de la incidencia de las LPP de los pacientes en comparación con las intervenciones individuales [28-34].

En la revisión sistemática de 21 trabajos, publicada por Lin et al [35], sobre la efectividad de programas de prevención multicomponentes en UCI del paciente adulto, los resultados muestran que los programas incluyen entre 2 a 11 componentes entre los que se encuentran: aclaración de las funciones del personal, introducción de nuevas

funciones, cambios posturales, educación del personal y del paciente, uso de superficies de apoyo, evaluación del riesgo de LPP, evaluación de la piel, evaluación de las necesidades de nutrición, documentación, participación de un equipo multidisciplinario y la movilización.

Autores como Kosmadakis et al [36], en la discusión de su artículo, juzgan que los cambios basados en intervenciones multidisciplinares, de enfermería, nutrición, actividad física y fisioterapia, así como las mejoras continuas en los materiales para la profilaxis de LPP, han mantenido las tasas de prevalencia estables a pesar del aumento de la edad media de los pacientes hospitalizados.

A continuación, se van a detallar las medidas preventivas más frecuentemente incluidas en los protocolos y su estado de evidencia actual.

4.1. Manejo de la presión: Cambios posturales, movilización precoz y superficies especiales

Aunque las LPP se pueden originar en cualquier zona anatómica donde se predisponga una presión mantenida en el tiempo, determinadas áreas son más propensas en función de la posición adoptada por el paciente, de tal forma que:

- En decúbito supino la región sacra, talones, coxis, codos, escápulas y zona occipital son las zonas de mayor presión.
- En decúbito lateral soportan mayor presión los maléolos, región trocantérica, costillas, hombros, orejas, crestas ilíacas y cara interna y lateral de las rodillas.
- En decúbito prono son los dedos de los pies, rodillas, genitales masculinos, pómulos, orejas, nariz y crestas ilíacas.
- En sedestación son el isquion, coxis, escápulas, trocánteres, talones y dedos de los pies.

Como se muestra en los datos aportados anteriormente, las localizaciones más frecuentes con diferencia son la región sacra y los talones [37-38].

Los cambios posturales y la movilización precoz de los pacientes son intervenciones dirigidas a reducir la duración y la magnitud de la presión sobre las zonas vulnerables del cuerpo, como las prominencias óseas [39-42].

Los cambios posturales son uno de los pilares básicos dentro de las medidas preventivas de las LPP, sin embargo, como muestra un meta-análisis reciente del grupo Cochrane, la literatura aún no aporta resultados significativos al comparar su aplicación con diferentes frecuencias de reposicionamiento (2 horas vs 3 o 4 horas) o posicionamiento [42]. En la práctica clínica, la frecuencia de 2 horas se considera el intervalo de tiempo estandarizado para la prevención de LPP y las guías de práctica clínica aconsejan el uso de inclinaciones no superiores a los 30º.

La movilización precoz se entiende como aquella intervención aplicada de forma temprana que proporciona un estímulo motor, sensitivo y propioceptivo con el objetivo de restablecer la función músculo-esquelética. Incluye técnicas de posicionamiento, movilización (pasiva, activo-asistido o activa), bipedestación y deambulación. En la última década han surgido una gran cantidad de estudios que analizan su aplicación principalmente en pacientes críticos mostrando sus beneficios en la prevención de complicaciones como la debilidad-adquirida en UCI y su asociación con la mejora de la capacidad funcional del paciente [43,44]. Es una técnica claramente segura, beneficiosa para el paciente y fácilmente implementable en el servicio [45]. De este modo, se ha producido una transición entre la cultura que predominaba hace una década de "inmovilización terapéutica" en el paciente crítico a un trabajo de inicio muy precoz sobre la movilidad y funcionalidad en cuanto la situación clínica del paciente lo permita.

Se debe tener en cuenta que la aplicación de cambios posturales y/o movilización precoz a veces se puede ver dificultada o contraindicada en situaciones especiales como por ejemplo [19,20,46]:

- Pacientes ingresados para cirugía cardíaca.
- Personas con inestabilidad hemodinámica.
- Obesidad mórbida.
- Personas con compromiso respiratorio que sufren un descenso de la saturación de oxígeno durante los cambios posturales.
- Personas politraumatizadas o con intervención neuroquirúrgica.

Por último, dentro de las medidas de manejo por presión tiene especial relevancia la Superficie Especial de Manejo de la Presión (SEMP) definidas por la GNEAUPP como:

> *"Superficie o dispositivo especializado, cuya configuración física y/o estructural permite la redistribución de la presión, así como otras funciones terapéuticas añadidas para el manejo de las cargas tisulares, de la fricción, cizalla y/o*

microclima, y que abarca el cuerpo de un individuo o una parte del mismo, según las diferentes posturas funcionales posibles" [47].

Algunas SEMP pueden tener propiedades en la reducción de la fricción y cizallamiento, así como el calor y la humedad.

La elección de una SEMP adecuada por parte del profesional debe ser individualizada y tener en cuenta los siguientes factores:

a) Nivel de inmovilidad e inactividad.
b) La necesidad de controlar el microclima y reducir el cizallamiento.
c) El tamaño y peso de la persona.
d) El número, gravedad y localización de las LPP existentes.
e) El riesgo de desarrollar nuevas LPP.

En todo caso, la utilización de una SEMP no sustituye otras medidas como el cambio postural o la movilización [48].

4.2. Escalas de valoración de riesgo de desarrollar LPP

Las herramientas de evaluación de riesgos (escalas) forman parte de una evaluación de riesgos estructurada en los protocolos de prevención de LPP. El principal objetivo de su aplicación es la identificación de aquellos pacientes que se encuentran en riesgo de desarrollar LPP, así como de aquellos factores de riesgo que podrían conducir a un LPP.

Las escalas de riesgo validadas más conocidas nacional e internacionalmente son las siguientes:

Escala de Norton:
Desarrollada en 1962 por Norton, McLaren y Exton-Smith [49], es la primera escala de valoración del riesgo de desarrollar LPP descrita en la literatura. Creada en el curso de una investigación sobre pacientes geriátricos, la escala está estructurada en cinco parámetros, al que se le otorga valores del 1 al 4:

- Estado mental.
- Incontinencia.
- Movilidad.
- Actividad.
- Estado físico.

Es una escala negativa, de forma que una menor puntuación indica mayor riesgo. Originalmente, su puntuación de corte se situaba en los 14 puntos, pero posteriormente, en 1987, Norton propuso modificar el punto de corte en 16.

Escala de Braden:

Desarrollada por Barbara Braden y Nancy Bergstrom [50] en 1985 en EE.UU en el contexto de un proyecto de investigación en centros sociosanitarios. La escala de Braden consta de seis subescalas, con una definición exacta de lo que se debe interpretar en cada uno de los apartados de estos subíndices:

- Percepción sensorial.
- Exposición de la piel a la humedad.
- Actividad física.
- Movilidad.
- Nutrición.
- Roce y peligro de lesiones cutáneas.

Escala EMINA [51]:

Escala elaborada y validada por el grupo de enfermería del Instituto Catalán de la Salud para el seguimiento de las LPP. Contempla cinco factores de riesgo: estado mental, movilidad, incontinencia, nutrición y actividad, puntuados de 0 a 3 cada uno de ellos. Con la primera letra de cada factor se le ha dado nombre a la escala.

Al igual que la Escala de Braden tiene una buena definición operativa de términos, lo que hace que disminuya la variabilidad entre interobservadores. Las autoras definen su punto de corte en cuatro, aunque otras investigaciones sugieren que, para hospitales de media estancia, el punto de corte debería ser 5.

Escala Waterlow [52]:

Escala desarrollada en Inglaterra en 1985 a partir de un estudio de prevalencia, al observar que la Escala Norton no incluía en el grupo de riesgo a muchos pacientes que desarrollaban LPP. Tras revisar los factores que intervienen en la etiología y la patogénesis de las LPP, Waterlow presentó una escala con seis subescalas (relación talla/peso, continencia, aspecto de la piel, movilidad, edad/sexo, apetito) y cuatro

categorías de otros factores de riesgo (malnutrición tisular, déficit neurológico, cirugía y medicación).

4.3. Cuidado preventivo de la piel y uso de apósitos profilácticos

Dentro de los cuidados de la piel se recomienda principalmente una correcta higiene diaria e hidratación de la piel, así como una inspección de la piel regular, principalmente en prominencias óseas, para identificar precozmente la lesión.

Es evidente que el mantenimiento de la integridad de la piel mediante el uso de apósitos, cremas u otros agentes tópicos es un factor importante en la prevención de la formación de LPP [53]. Algunos estudios muestran que la aplicación de agentes tópicos como los ácidos grasos hiperoxigenados puede reducir la incidencia de LPP en comparación a un producto de control [54,55]. En zonas de la piel expuestas a humedad excesiva (debido a incontinencia o transpiración) las guías recomiendan el uso de productos barrera que no contengan alcohol. Por otro lado, el papel de los apósitos en la prevención de LPP se justifica en los beneficios que presentan al redistribuir la presión, proteger la piel de las fuerzas de fricción y cizallamiento, así como de gestionar eficazmente la humedad de la piel [56]. Por ejemplo, los apósitos de espuma multicapa han mostrado su efectividad en la prevención de LPP en regiones como los talones [56,57] y el sacro [57-59] en pacientes hospitalizados, aunque los autores recomiendan ser precavidos en su uso en casos de lesionados medulares, principalmente tetrapléjicos completos puesto que no se observa reducción de las tasas de incidencia.

5. Evaluación de LPP

En aquellas lesiones de estadio 2 o superior es fundamental realizar una valoración integral para determinar la capacidad de cicatrización e identificar los factores de riesgo que pueden facilitar u obstaculizar la curación de las heridas. Según diversas guías de práctica clínica [2,19-20,60], la valoración integral inicial debe incluir entre otros:

a) Una historia clínica y psicosocial y realizar un examen físico.
b) La evaluación del riesgo de nuevas LPP.
c) Evaluación y registro pertinente de seguimiento de las principales características de LPP como la antigüedad de la lesión; tamaño (longitud, anchura y profundidad); localización de la lesión; forma, presencia de tunelización, fistulas

o cavitación; tipo de tejido en el lecho de la herida (granulación o epitelización, esfacelado y/o necrótico); exudado (tipo, cantidad, olor y color); bordes de la herida (indistintos, difusos, engrosados); volumen e integridad de la piel perilesional (integra, lacerada, macerada, reseca), etc. Se recomienda aplicar el mismo método de valoración de forma sistemática para determinar con precisión y fiabilidad los cambios que se van produciendo en la herida.

d) La evaluación de posibles signos y síntomas de infección (colonización crítica superficial/infección localizada o infección profunda circundante/infección sistémica).
e) La valoración del estado nutricional y del riesgo nutricional.
f) La presencia de dolor.
g) La valoración de un posible riesgo vascular.
h) Las fuentes de presión y cizallamiento.

5.1. Escalas multidimensionales de LPP

Con el objetivo de ser lo más sistemático posible en la recogida de aquellos datos que permiten evaluar el progreso de las LPP se han desarrollado y validado varias escalas en la literatura como son: el trabajo de Verhonick en la escala observación de UPP [61], la escala Sessing [62], la escala WHS (*Wound healing Scale*) [63], la herramienta de cicatrización de Sussman [64], la escala PSST (*Pressure Sore Status Tool*) desarrollada por Bates-Jensen [65], la escala PUSH (*Pressure Ulcer Scale for Healing*) [66] diseñada por la NPIAP, la escala DESIGN [67] y la escala española CODED [68].

5.2. Estadiaje en LPP

El sistema de estadificación del *National Pressure Injury Advisory Panel* (NPIAP), cuya última revisión y actualización fue publicada en 2016, es el más utilizado internacionalmente en la práctica clínica [3]. Este sistema de estadiaje solo se puede aplicar a LPP, de forma que aquellas úlceras y/o heridas no relacionadas con la presión están sujetas a otros sistemas de estadificación basados en el tipo de herida, por ejemplo, las úlceras del pie diabético a través del sistema de clasificación de Wagner, las úlceras venosas de la pierna en función de la fisiopatología de la anatomía y etiología clínica, o la clasificación de quemaduras según la superficie corporal total afectada.

A continuación, se detalla la clasificación desarrollada por la NPIAP:

Estadio 1. Eritema no blanqueable en piel integra.

Piel intacta con una zona localizada de eritema no blanqueable, que puede aparecer de forma diferente en pieles de pigmentación oscura. La presencia de un eritema blanqueable o los cambios de sensibilidad, temperatura o firmeza puede preceder a los cambios visuales. Los cambios de color no incluyen la coloración purpura o marrón; estos pueden indicar una lesión por presión tisular profunda (DTPI).

Imagen 1. LPP estadio 1.

Fuente de la imagen: NPIAP. Disponible en: https://npiap.com/page/PressureInjuryStages

Estadio 2. Pérdida parcial del espesor de la piel.

Pérdida de espesor parcial de la piel con dermis expuesta. El lecho de la herida es viable, rosado o rojo, húmedo, y también puede presentarse como una ampolla/flictena serosa intacta o rota. El tejido adiposo y los tejidos más profundos no son visibles. No hay tejido de granulación, ni esfacelos ni escaras. Estas lesiones suelen ser el resultado de un microclima adverso y de un cizallamiento en la piel de la pelvis y del talón. Este estadio no debe utilizarse para describir las lesiones cutáneas asociadas a la humedad (en inglés conocido como Moisture Associated Skin Damage, MASD), incluida la dermatitis asociada a la incontinencia (IAD), la dermatitis intertrigosa (ITD), las lesiones cutáneas relacionadas con el adhesivo médico (MARSI) o las heridas traumáticas (desgarros cutáneos, quemaduras, abrasiones).

Imagen 2. LPP estadio 2.

Fuente de la imagen: NPIAP. Disponible en: https://npiap.com/page/PressureInjuryStages

Estadio 3. Pérdida total del espesor de la piel.

Pérdida de todo el grosor del tejido cutáneo, en la que es visible el tejido adiposo en la úlcera y raramente presenta tejido de granulación y bordes engrosados. La piel subcutánea y el músculo pueden ser visibles, además de esfacelos y/o escara. La profundidad del daño tisular varía según la localización anatómica; en áreas con mucho tejido adiposo se pueden desarrollar úlceras profundas. Pueden tener tunelizaciones y excavaciones bajo los bordes. La fascia, músculo, tendón, ligamentos, cartílagos y/o huesos no quedan expuestos. Si los esfacelos o escara impiden ver la extensión de la pérdida de tejido, entonces es una LPP no estadiable.

Imagen 3. LPP estadio 3.

Fuente de la imagen: NPIAP. Disponible en: https://npiap.com/page/PressureInjuryStages

Estadio 4: Pérdida total del espesor de los tejidos.

Pérdida de piel en todo su espesor y de tejidos con fascia, músculo, tendón, ligamentos, cartílagos o hueso expuestos o directamente palpables en la úlcera. Pueden ser visibles esfacelos y/o escaras. A menudo hay bordes engrosados, excavados y/o tunelizaciones. La profundidad varía según la localización anatómica. Si los esfacelos o escaras impiden ver la extensión de la pérdida de tejidos entonces es una LPP no estadiable.

Imagen 4. LPP estadio 4.

Fuente de la imagen: NPIAP. Disponible en: https://npiap.com/page/PressureInjuryStages

LPP no estadiable: Pérdida completa de piel y tejidos no visible completamente.

Pérdida de piel total y de tejidos en la que la extensión del daño tisular en la úlcera no se puede confirmar debido a la existencia de esfacelos o escaras. Si se retiran los esfacelos o la escara, se podrá ver una LPP de estadio 3 o estadio 4. Una escara estable (ej. seca, adherida, intacta, sin eritema ni fluctuación) en talones o una extremidad isquémica no se debe reblandecer ni retirar.

Imagen 5. LPP no estadiable .

Fuente de la imagen: NPIAP. Disponible en: https://npiap.com/page/PressureInjuryStages

Lesión de tejidos profundos por presión: Decoloración persistente no blanqueable, rojo, marrón o violácea.

Piel intacta o no intacta con una zona localizada de decoloración persistente no blanqueable, roja, marrón o violácea o separación epidérmica que muestra una úlcera con lecho oscuro o una ampolla sanguinolenta. El dolor y el cambio de temperatura suelen preceder a los cambios en la coloración de la piel. La decoloración puede aparecer de forma diferente en piel de pigmentación oscura. Esta lesión se produce por fuerzas de presión y cizalla intensa y/o prolongadas en la interfaz hueso-músculo. La herida puede evolucionar rápidamente para mostrar el alcance real del daño tisular, o puede resolverse sin pérdida de tejido. Si son visibles tejidos necrótico, tejidos subcutáneos, tejidos de granulación, fascia, músculo u otras estructuras subyacentes, esto indica una LPP de grosor total (no estadiable, estadio 3 o estadio 4). No se debe usar la lesión de tejidos profundos por presión para describir problemas vasculares, traumáticos, neuropáticos o dermatológicos.

Imagen 6. Lesión de tejidos profundos por presión.

Fuente de la imagen: NPIAP. Disponible en: https://npiap.com/page/PressureInjuryStages

LPP en la membrana mucosa.

Se encuentran en las membranas mucosas con antecedentes de uso de un dispositivo medico en el lugar de la lesión. Estas úlceras no pueden ser estadificadas.

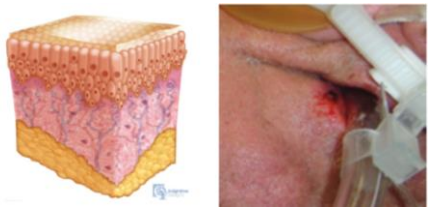

Imagen 7. LPP en membrana mucosa.

Fuente de la imagen: NPIAP. Disponible en: https://npiap.com/page/PressureInjuryStages

6. Complicaciones e impactos de la LPP

6.1. Dolor

El dolor es uno de los principales síntomas relacionados a las LPP, asociado especialmente en determinados momentos como los cambios de apósito o al realizar la cura de la herida [69]. Este dolor puede reducir la capacidad de la persona para las actividades de la vida diaria, la movilidad y el sueño [70], e incluso dificultar el proceso de rehabilitación [71], por este motivo en los últimos años se ha incrementado su investigación.

En un estudio publicado en 2016, que evaluó la prevalencia e impacto del dolor asociado a LPP o áreas de presión en pacientes hospitalizados, los resultados mostraron que una de cada seis personas en hospitales de agudos experimenta un dolor relacionado con el área de presión no atribuido en zonas de la piel “de riesgo”; una de cada ocho personas sin LPP y más de dos de cada cinco personas con LPP [72]. De hecho, el dolor no solo implica un impacto en la calidad de vida del paciente, sino que su presencia en un área de presión se puede considerar un factor de riesgo que incrementa la probabilidad de desarrollar de LPP de grado 2 [73].

En los diferentes estudios que analizan dicha variable asociada a LPP, las escalas más utilizadas en la medición del dolor son la Escala Visual Analógica (EVA) y la escala de evaluación verbal, aunque también se manejan otras escalas en su valoración como la Escala Numérica del Dolor, cuestionario de dolor de McGill forma abreviada (SF-MPQ), escala de intensidad de dolor y escala de caras de dolor [74].

6.2. Infección

Una de las complicaciones más importantes de las LPP son las infecciones que pueden abarcar desde un proceso infeccioso local de la herida hasta una infección de tejidos blandos, osteomielitis y bacteriemia.

Aunque las bacterias son una parte común de la microbiota de la piel intacta y de las heridas, un umbral crítico de bacterias existentes y la formación de un biofilm pueden impedir la cicatrización de la herida alargando el proceso habitual de la fase inflamatoria. Algunos estudios han propuesto dicho umbral crítico en 10^5 Unidades Formadoras de Colonias (UFC) por gramo de tejido como delimitación entre la colonización y una infección clínicamente relevante que puede impedir la cicatrización [75].

Según la Unión Mundial de Sociedades de Cura de Heridas (*World Union of Wound Healing Societies*, WUWHS) [76], las etapas de la infección de la herida se corresponden con el aumento gradual del número y virulencia de los microrganismos, junto con la respuesta que suscitan en el huésped. Asimismo, describe su progresión desde un equilibrio bacteriano a aquel daño producido por la acción de microorganismos a lo largo de un proceso continuo caracterizado por las siguientes fases: contaminación, colonización, infección localizada, infección en expansión e infección sistémica.

La infección en las heridas crónicas suele ser polimicrobiana. De los numerosos microorganismos que colonizan las LPP, los expertos consideran que el *Staphylococcus Aureus* y la *Pseudomonas Aeruginosa* son las cepas microbianas predominantes en los cultivos realizados a pacientes con heridas infectadas [77-79].

Como se indica en la guía de consulta rápida (2019) publicada por EPUAP/NPIAP/PPPIA [60], el profesional sanitario debe tener un elevado índice de sospecha de infección en una LPP cuando ocurra alguna de las siguientes situaciones:

- Cicatrización retrasada.
- Ausencia de signos de cicatrización durante las dos semanas anteriores a pesar de recibir tratamiento adecuado.
- Aumento de tamaño y/o profundidad.
- Rotura/dehiscencia de la úlcera.
- Tejido necrótico.
- Tejido de granulación friable.
- Tunelizaciones o puentes en el lecho de la herida.

- Aumento del exudado o cambios en la naturaleza del exudado.
- Aumento del calor en el tejido alrededor de la úlcera.
- Aumento de dolor.
- Mal olor.

ESTADO ACTUAL DEL PROBLEMA

7. Situación epidemiológica

Al analizar los datos sobre prevalencia de LPP se observan resultados muy variables entre los diferentes países. Un reciente metaanálisis de 39 estudios de todo el mundo con una muestra total de 2 579 049 sitúa la prevalencia global en 12.8%, presentando como estadiaje más frecuente el estadio 1 (43.5%) y el estadio 2 (28%) y las localizaciones corporales más habituales el sacro, talones y cadera [37]. En concreto, la prevalencia media en los países europeos se estima del 10.8% (rango, 4.6-27.2%) en una revisión sistemática de 79 artículos [38] en la que también se señala el sacro como la localización más frecuente y casi un 32.4% de las LPP estaban en estadio I.

A pesar de que no existen estudios generales nacionales o autonómicos publicados, desde 2001 en España el grupo GNEAUPP realiza un estudio epidemiológico nacional cada 4 años (2001, 2005, 2009, 2013 y 2017) para determinar la prevalencia de las LPP en hospitales, residencias y centros de Atención Primaria en España a través de un formulario online de participación voluntaria. Estos estudios son una de las principales referencias epidemiológicas a nivel nacional y muestran en su último estudio una estimación de prevalencia de LCRD en un 8.7% y en un 7% la de LPP [80], estos datos en general son inferiores a los presentados en otros países europeos y a nivel mundial. Por ejemplo, artículos publicados sitúan la prevalencia de LPP en adultos en un 14.9% en Noruega [81], entre el 15.1% y el 25.1% en Canadá [82], entre el 2.2% y el 23.9% en Estados Unidos [83], el 24.7% en Italia [84] y un 8.9% en Reino Unido [85].

La incidencia de las LPP también difiere en función del entorno clínico. Son muchos los estudios recientes que analizan la epidemiologia en unidades especiales como cuidados intensivos [86], en poblaciones de alto riesgo como las personas mayores [87], en patologías específicas como la lesión medular [88,89] o postquirúrgicos [90,91].

En los últimos años, la literatura comienza a destacar a aquellas LPP asociadas con dispositivos médicos (dispositivos respiratorios, collarines, dispositivos de intubación, férulas, catéteres intravenosos, etc.) conocidas en inglés como *Medical device-related pressure injury* (MDRPI). En una revisión sistemática con metaanálisis que incluye 13 estudios se reporta en las Unidades de Cuidados Intensivos (UCI) una tasa de incidencia de MDRPI entre 0.9% y 41.2% mientras que la tasa de prevalencia varían ampliamente entre el 1.2% y 121% [92]. Otra revisión con metaanálisis publicada en el mismo año

revela una incidencia del 12% y una prevalencia de 10% de las LPP relacionadas con dispositivos médicos [93]. En ambos artículos existe una elevada heterogeneidad que debe tenerse en cuenta.

8. LPP en el contexto clínico actual del SARS-CoV-2

El desafío supuesto por la pandemia originada por el nuevo coronavirus SARS-CoV-2 ha puesto a prueba nuestro sistema sanitario en todos los niveles asistenciales ante situaciones de emergencia. Eventos adversos con LPP adquiridas en el ámbito hospitalario han sido un problema de salud pública durante décadas, por lo que la aparición de una pandemia ha podido dar lugar a problemas imprevistos de seguridad y calidad asistencial recibida por el paciente.

Actualmente son pocos los estudios que evidencian el impacto que ha podido causar la pandemia en los cuidados de salud, en concreto, en la prevención y tratamiento de las LPP, contexto en el que se desarrolla este trabajo. Sin embargo, entidades como la NPIAP [94] se posiciona en su artículo sobre la "inevitabilidad de las LPP durante la pandemia por COVID-19" reconociendo la posible dificultad de implementar medidas preventivas, principalmente en la primera parte de la crisis de COVID-19, así como la falta de equipos adecuados (superficies de apoyo, colchones, dispositivos de descarga de talones, cojines de distribución de la presión, etc.) y de productos necesarios para el cuidado de la piel y las heridas.

En este nuevo contexto, solo se ha localizado un artículo publicado en el que los autores analizan la incidencia mensual de LPP hospitalarias durante la primera ola observando una fluctuación con un aumento constante de marzo a mayo de 2020 y un descenso en junio hasta un mínimo en julio, y que los autores interpretan como una capacidad de la organización del sistema de salud para aprender rápidamente durante una crisis [95]. Recientemente, se han publicado artículos que centran su atención en el impacto directo de la pandemia en el diagnóstico, cuidado y cicatrización de las heridas. Por ejemplo, los resultados de un estudio realizado en Alemania muestran como consecuencias negativas el retraso en el diagnóstico, la hospitalización y acceso al servicio de atención primaria [96]. Otra investigación señala que solo el 23% de los pacientes/cuidadores de la muestran consideran que han recibido unos cuidados sanitarios iguales que los previos a la pandemia [97].

Al analizar los posibles factores intrínsecos y extrínsecos que han afectado al desarrollo de las LPP durante este periodo crítico debemos destacar la reunión virtual del *European Pressure Ulcer Advisory Panel* (EPUAP) celebrada en septiembre 2020 [98]. En esta reunión se exponen los tres factores más destacados que relacionan las LPP con la enfermedad COVID-19 y sus morbilidades:

1) Los vínculos entre la fisiopatología de la COVID-19 y la etiología de LPP.
2) Las LPP relacionadas con dispositivos médicos y el uso de estrategias terapéuticas como el decúbito prono para el cuidado del paciente con distrés respiratorio.
3) La importancia del papel de la inflamación en la etiología de las LPP.

JUSTIFICACIÓN E INTERÉS DEL ESTUDIO

Como se describe con anterioridad, son numerosos los estudios que centran su atención en la prevención de las LPP, puesto que la literatura ha evidenciado su implicación en la morbilidad y pérdida de calidad de vida del paciente. Sin embargo, se continúan observando cifras de prevalencia similares a lo largo de los años tal como indican los estudios nacionales previamente mencionados del grupo GNEAUPP.

Aunque históricamente se ha considerado un problema de enfermería, las guías clínicas internacionales muestran la necesidad de un abordaje multidisciplinar tanto en su prevención como tratamiento, abordado desde una perspectiva global de cuidados en la que se incluyen entre otros factores aquellos relacionados con la mejora de la movilidad y funcionalidad, del abordaje adecuado nutricional, la correcta elección de productos tópicos para la hidratación cutánea o facilitación de la cicatrización en úlceras ya establecidas. Desde esta perspectiva interdisciplinar, se pretende abordar un evento adverso frecuente y prevenible desde la base de un conocimiento actualizado de su situación epidemiológica en la provincia de Salamanca.

El contexto clínico pandémico vivido durante el año 2020 y la posibilidad de nuevas enfermedades emergentes que puedan suponer un problema de salud pública en el futuro, nos llevó a replantear el objetivo inicial y adaptar nuestra línea de trabajo a la situación sanitaria, a fin de conocer la dimensión epidemiológica de las lesiones por presión en Salamanca durante el periodo de crisis sanitaria originado por la infección SARS-CoV-2, así como la capacidad de adaptación de las medidas preventivas del sistema sanitario en situaciones de sobrecarga asistencial máxima.

Consideramos oportuno determinar la prevalencia e incidencia real de este tipo de lesiones en sus cuatro estadios en el contexto sanitario actual y poder realizar un seguimiento de los pacientes a lo largo de su periodo de hospitalización. Así como, actualizar los conocimientos sobre las lesiones por presión, lo que permitirá establecer estrategias de prevención para fortalecer los cuidados en salud y optimizar los recursos y costes que genera el tratamiento de este tipo de lesiones.

OBJETIVOS

Objetivo general

Conocer la dimensión epidemiológica de las heridas crónicas en Salamanca durante un periodo de crisis sanitaria, originada por la nueva infección SARS-CoV-2, así como la capacidad de adaptación de las medidas preventivas del sistema sanitario en situaciones de sobrecarga asistencial máxima.

Objetivos específicos

Para llevar a cabo el objetivo general expuesto, nos planteamos los siguientes objetivos específicos:

1. Revisar, analizar y sintetizar la evidencia científica disponible sobre la aplicación de medidas de prevención en LPP desde el punto de vista fisioterápico, como base actualizada y guía para la toma de decisiones clínicas –práctica basada en la evidencia-.
2. Evaluar la carga asistencial que supone las lesiones cutáneas crónicas entre los pacientes hospitalizados en el Servicio de Medicina Interna del Complejo Asistencial Universitario de Salamanca (CAUSA) durante la primera ola de la crisis del nuevo coronavirus SARS-CoV-2, del 1 de Marzo a 1 de Junio de 2020.
3. Medir la frecuencia y describir las características clínicas de las LPP entre los pacientes hospitalizados en Servicio de Medicina Interna del CAUSA durante la primera ola de la crisis del nuevo coronavirus SARS-CoV-2, del 1 de Marzo a 1 de Junio de 2020.
4. Cuantificar y comparar los registros de lesiones cutáneas crónicas en pacientes hospitalizados en el Servicio de Medicina Interna del CAUSA entre el periodo prepandémico (año 2019) y el primer año de crisis sanitaria por la COVID-19 (2020), así como las diferencias entre olas durante ese mismo año.

RESULTADOS:

PUBLICACIONES ORIGINALES

Artículo Primero

Can an early mobilization program prevent Hospital Acquired Pressure Injures in an intensive care unit? A systematic review and meta-analysis.

¿Puede un programar de movilización precoz prevenir las LPP adquiridas en el hospital en UCI? Una revisión sistemática y metaanálisis.

Objetivo: Analizar el posible efecto de un programa de movilización temprana, aplicado a pacientes hospitalizados en UCI, en la prevención de las LPP adquiridas en el hospital en comparación con la atención estándar.

Metodología: Revisión sistemática y metaanálisis de los trabajos publicados hasta el 1 de Mayo de 2020. La estrategia de búsqueda incluyó los descriptores conocidos sobre el tema y se efectuó en diferentes bases de datos. Finalmente, se aplicaron los modelos estadísticos adecuados para abordar el tamaño del efecto.

Resultados: Se realizaron búsquedas en un total de once bases de datos hasta el 1 de mayo de 2020 y se incluyeron siete estudios (n = 7.520) relacionados con el efecto de protocolos de movilización temprana en la prevención de las LPP adquiridas en el hospital (cinco cuasi-experimentales y dos comparativos aleatorios). Para minimizar el riesgo de sesgo se utilizó la herramienta ROBINS-I. Los cinco estudios cuasi-experimentales fueron significativamente heterogéneos (p=0,02 para la prueba Q y 66% para I2), y la odds ratio fue de 0,97 [Intervalo de confianza (IC) del 95%: 0,49-1,91) con una diferencia estadística no significativa entre ambos grupos (p=0,93).

Conclusión: Esta revisión y metaanálisis muestra resultados no concluyentes respecto a la relación de la implementación de un programa de movilidad temprana en la prevención de las LPP en pacientes críticos. Por tanto, es preciso realizar investigaciones futuras teniendo en cuenta la escasa literatura sobre este tema.

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ORIGINAL ARTICLE

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Can an early mobilisation programme prevent hospital-acquired pressure injures in an intensive care unit?: A systematic review and meta-analysis

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Abstract

A systematic review and meta-analysis were conducted to clarify the effect of an early mobilisation programme on the prevention of hospital-acquired pressure injuries in an intensive care unit as opposed to standard care. We searched a total of 11 databases until 1 May 2020 and included seven studies (n = 7.520) related to the effect of early mobilisation protocol in the prevention of hospital-acquired pressure injuries (five quasi-experimental and two random comparative). The five quasi-experimental studies were significantly heterogeneous ($P = .02$ for Q test and 66% for I^2), and the odds ratio was 0.97 (95% CI: 0.49-1.91) with a non-significant statistical difference between both groups ($P = .93$). Our study shows inconclusive outcomes related to the effect of the implementation of an early mobility programme in the prevention of pressure injuries in critical patients. Future research is needed considering the small number of articles on the topic.

KEYWORDS

early mobility programme, intensive care unit, pressure injuries, prevention, systematic review

1 | INTRODUCTION

Pressure injury (PI), also known as pressure ulcer, is defined as a "localized damage to the skin and underlying soft tissue, usually over a bony prominence or related to a medical or other device; resulting from intense and/or prolonged pressure or pressure in combination with shear."[1] In general, it is understood that hospital-acquired pressure injuries (HAPIs) are a preventable problem; for this reason, they are used as a negative indicator of the quality of care and patient safety. These are associated with increased mortality and mobility and decreased quality of life. Moreover, it is correlated with an increase in health care resource utilisation and significant health care costs. The development of HAPIs has a multifactorial aetiology,[2,3] and according to a recent review, critically ill patients have particularly high risk factors for PIs related to age, perfusion, mobility/activity, and vasopressor infusion.[4]

International clinical practice guidelines for the prevention and treatment of PIs focus on evidence-based recommendations in repositioning and early mobilisation among other topics.[5] Latest recommendations of health care in the intensive care unit (ICU) are based on the ABCDEF bundle[6] (Awaken from sedation, Breathe independently of the

ventilator, Choice of sedation, Delirium management, Early Mobilization and Exercise, and Family engagement and empowerment) and Pain, Agitation/sedation, Delirium, Immobility (rehabilitation/mobilization), and Sleep (disruptions) (PADIS) guideline.[7] Note that, in this context, both share the early mobilisation component. A recent systematic review shows that there is no consensus on the definition of the term "early mobilisation" (EM),[8] with a wide timeframe from the beginning of EM activities. Currently, there are several EM protocols[9-15] covering a wide range of interventions, including positioning, range-of-motion exercises (ROM), electrical muscle stimulation, cycle ergometers, tilt tables, transfer training, progressive resistance exercises, ambulating, and functional mobilisation.[15]

ICU early mobility programmes (EMP) are associated with an improvement in clinical outcomes, such as decrease in days of delirium, increase of functional status, decreased hospital and ICU length of stay (LOS), decreased mortality, significant economic cost, and patient and family satisfaction with care.[7,16] This study aims to establish whether the implementation of an EMP could reduce the development of HAPIs in an ICU.

Key Messages

- this is one of the first reports to analyse the effects of the implementation of an early mobilisation protocol on the prevalence of hospital-acquired pressure injuries in the intensive care unit
- a systematic review identified seven studies on the prevalence of hospital-acquired pressure injuries after implementation of an early mobility protocol in the intensive care unit
- the meta-analysis did not show significant effects on prevention, and an early mobilisation protocol may improve other clinical outcomes
- future studies with rigorous designs are recommended in order to gather better evidence and improve critical care quality

2 | MATERIAL AND METHODS

2.1 | Study design

This systematic review was planned in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement.[17] Study eligibility was defined according to the conventional Population-Intervention-Comparison-Outcomes-Study type (PICOS) criteria,[18,19] which were determined a priori, including the following: *Population* (intensive care adult patient); *Intervention* (early mobilisation programme); *Comparators* (standard care); *Outcomes* (HAPIs); and *Study design* (randomised controlled trial, non-randomised controlled trial, controlled quasi-experimental studies, empirical observational studies). Therefore, we considered the following review question: *Can an EMP improve HAPI prevention in ICU patients as opposite to a standard care protocol?*

2.2 | Search strategy

An extensive systematic search has been carried out across relevant databases and evidence summaries related to the health care area: *Trypdatabase*, *Cochrane Library*, *Epistemonikos*, *National Guideline Clearinhouse (NGC)*, *National Institute for Health and Care Excellence (NICE)*, *Scottish Intercollegiate Guidelines Network (SIGN), PubMed (Medline), Scopus, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Embase, and Physiotherapy Evidence Database (PEDro)*. The search will be performed for studies from inception to May 1, 2020.

The following search key words or MeSH vocabulary thesaurus and Boolean operators were entered: ["early ambulation" OR "early mobilization" OR "early mobility program" OR "early mobility protocol"] AND ["pressure ulcer" OR "pressure injury"] AND ["Intensive Care Unit" OR "ICU"]. A sample search is included in Appendix A.

2.3 | Selection criteria

All relevant studies, edited in English or Spanish, that reported the assessment of the effects of an EMP in an ICU and included PI rates and were published in a peer-reviewed journal were considered for analysis and classified according to levels of evidence and grades of recommendation proposed by the Oxford Centre for Evidence-Based Medicine (OCEBM).[20]

The *inclusion criteria* covers studies published in peer-reviewed journals involving adult patients (≥18 years old) hospitalised in the ICU, where an early mobility protocol/programme is implemented, its success is compared against usual care, and the development of HAPIs is treated as a clinical outcome; it also includes prospective or retrospective observational studies or clinical trials [OCEBM Levels of evidence 1-4, Grades of Recommendation A-C].

On the other hand, the *exclusion criteria* discard studies involving paediatric populations; publications in languages

other than English or Spanish; and data from editorials, letters to editors, reports of expert committees, and opinions of respected authorities based on clinical experience because these designs do not have the same value, impact, or power to make decisions or make recommendations [OCEBM Level of Evidence 5, Grade of Recommendation D].

2.4 | Selection of studies, data extraction, and quality assessment

First, initial screenings were performed by title followed by abstract; then, the full text was read, and articles were assessed independently for fulfilment of the inclusion criteria by two authors (L. N. G. and M. A. S.). Disagreements regarding the inclusion or exclusion of articles were resolved by discussion.

A systematic method was applied to data collection from each included study. All relevant texts, tables, and figures were reviewed for data extraction. The data collected were the first author's name, year of publication, country of origin, study objective, study design, trial time period, number of patients, population characteristics, EMP, frequency and duration of EMP sessions, EMP team, HAPI incidence or prevalence rates, HAPI data records source, ICU LOS, hospital LOS, adverse events, and other significant clinical outcomes.

Two team members (L. N. G and M. A. S.) independently reviewed each eligible study and extracted the information and data necessary to carry out the qualitative analysis and the meta-analysis. They followed the methodological standards recommended by the *Committee on Standards for Systematic Reviews of Comparative Effectiveness Research* for finding and assessing individual studies: They worked independently, screened and selected articles, and extracted quantitative and other critical data from included studies.

Each eligible study was systematically appraised for risk of bias, relevance to the study's populations, and outcome measures. To evaluate risk of bias, we used the seven item-based Risk Of Bias In Non-randomized Studies—of Interventions (ROBINS-I)[21] risk-of-bias assessment tool. Moreover, OCEBM Levels of Evidence and Grades of Recommendation[20] were applied to determine the certainty of evidence generated and strength of recommendations. We used the recommendations of the PRISMA declaration as a guide. Disagreements were resolved by consensus among all authors.

2.5 | Meta-analysis methods

Meta-analysis was performed using the *Cochrane Review Manager* (Rev Man 5.3) software. To combine studies to find a summary effect, we resorted to Mantel-Haenselz statistical weights. Heterogeneity across studies was assessed using the *Cochrane Q-statistic* ($P < .05$ was considered statistically significant), and homogeneity of studies was rejected. Statistical heterogeneity was measured using the I^2 statistic: $I^2 = 0\%$ to 25%, no heterogeneity; $I^2 = 25\%$ to 50%, moderate heterogeneity; $I^2 = 50\%$ to 75%, large heterogeneity; $I^2 = 75\%$ to 100%, extreme heterogeneity. A *fixed-effect model* was applied if there was no significant heterogeneity across studies ($I^2 < 50\%$). Otherwise, a *random-effect model* was used when significant heterogeneity was detected between studies ($I^2 > 50\%$). The significance of the pooled odds ratio was evaluated with the *Z test* and its two-tailed *P* value. *Forest plots* with odds ratios and their 95% confidence intervals were used to visualise all results. In addition, a *funnel plot* was performed to analyse the publication bias.

3 | RESULTS

3.1 | Search results

A PRISMA flow diagram of the literature search is given in Figure 1. By searching the electronic databases, we identified 803 records related to the effects of EM in the ICU. Finally, we included seven studies fulfilling the inclusion criteria and added them to the qualitative synthesis. Only five of them were included in the quantitative analysis.

3.2 | Study characteristics

Seven articles[22-28] researching the effect of EMP on ICU and PI rates were selected and classified by type of study design. Included studies were prospective or retrospective two-group comparative and pre-post quasi-experimental research. Table 1 summarises the main methodological data of these studies in alphabetical order. According to the OCEBM classification, the level of evidence of the selected articles ranged between levels 2a and 2c.

The oldest publication dates back to 2012 from *Titsworth* et al,[28] while the most recent was published in 2016 by Floyd et al.[26] The geographic location of all studies was centred in the United States. The total sample size of the included studies was 7.520.

The ROBINS-I tool was used to assess the risk of bias in the included articles. Of all the studies of interventions analysed, only one study showed a low risk of bias (RoB), while four showed a moderate RoB, and two studies were classified as serious RoB (Table 2).

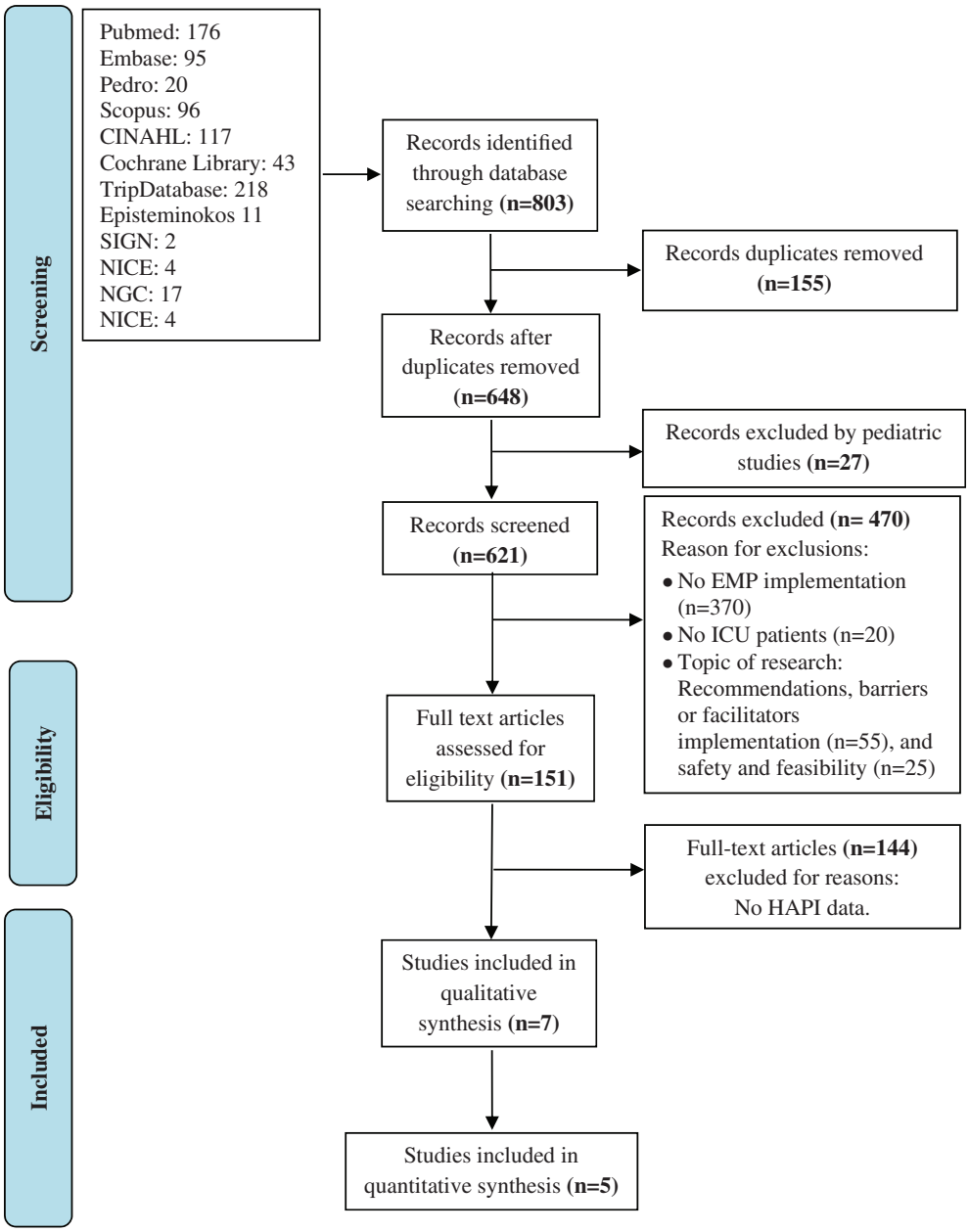

FIGURE 1 Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram summarising the results for this systematic review and meta-analysis

3.3 | Qualitative synthesis outcomes

3.3.1 | EMP Characteristics

Table 3 summarises the main qualitative data collected from the studies that were analysed, and Table 4 shows others relevant outcomes related to the implementation of the EMP.

Those EMPs were implemented in different subspecialties of intensive care: neurological ICU,[27,28] medical ICU,[22,26] coronary ICU,[26] surgical ICU,[24,26] thoracic and cardiovascular ICU,[25] and burn and trauma ICU.[23]

Several types of EMP were identified, each structured in different levels or phases. Each programme is detailed extensively according to its levels and mobility techniques in Appendix Table B1. However, all of them showed similar treatment progression according to the clinical evolution of the patients and included widespread techniques such as ROM, repositioning, transferring, staying, and walking. No adverse effects were reported among patients in the mobility group.[22,23,26,28]

In all EMPs, the frequency of mobilisation is daily, while the number of repetitions and the duration of each exercise are different. Even so, the progression of the patient through the levels or phases of mobility is dependent on the patient´s overall physical and clinical stability and tolerance.

The development of these mobilisation programmes usually involved an interdisciplinary team, often comprised of physiotherapists (PT), nurses, occupational therapists, physicians, rehabilitators, and care assistants.

TABLE 1 Main methodological data of included studies

Author/s (Ref)] Year	Country	ICU setting	Follow-up period	Study Design	Level of evidence (OCEBM)	Sample (n)	G1 (n)	G2 (n)
Azuh et al[22] (2016)	United States	MICU (Braden scale score < 19)	Pre-EMP: 1 year Post-EMP: 1 year	Pre and post quasi-experimental design.	2c	3.233	NA	NA
Clark et al[23] (2013)	United States	TBICU	Pre-EMP: 11 months Post-EMP: 11 months	Pre and post quasi-experimental design	2c	2.176	1.044	1.132
Dickinson et al[24] (2013)	United States	SICU	Pre-EMP: 6 months Post-EMP: 5 months	Pre and post quasi-experimental design	2c	1.112	555	557
Floyd et al[25] (2016)	Unites States	TCV ICU	1-year period	Randomised matched pairs design	2b	60	30	30
Fraser et al[26] (2015)	United States	MICU, SICU and Coronary ICU	2 month-control group 11 month-mobilisation group	Two-group random comparative study (retrospective)	2b	132	66	66
Klein et al[27] (2015)	United States	NICU	Pre-EMP: 4 months Post-EMP: 4 months	Pre and post quasi-experimental design	2c	637	260	377
Titsworth et al[28] (2012)	United States	NICU	Pre-EMP: 10 months Post-EMP: 6 months	Pre and post quasi-experimental design	2c	170	77	93

Abbreviations: G1, control group or pre-intervention group sample; G2, intervention/mobilisation group sample; MICU, medical intensive care unit; NA, no data available; NICU, neurological intensive care unit; SICU, surgical intensive care unit; TBICU, burn and trauma intensive care unit; TCV ICU, thoracic cardiovascular intensive care unit.

3.3.2 | HAPI outcomes

Most of the studies collect incidence or prevalence data from electronic medical or nursing records while specifying the staging system used. Only two studies describe in detail the frequency of skin assessment and who performs it.[22,28]

From a qualitative assessment of the seven studies, three of the studies found that the correlation between HAPI prevalence rates and EMP implementation was not statistically significant,[23,24,28] three of them reported a decrease of HAPI rates with statistical significance,[22,26,27] and only one observed reduced HAPI rates but without statistical significance.[25] Within the statistically significant quasi-experimental studies, HAPI rates decreased by 2.7%[27] and 3.1%.[22]

3.4 | Quantitative synthesis using meta-analysis

Figure 2 shows the results obtained from comparing the pre-EMP group with the post-EMP group for the quasi-experimental studies. These five studies are significantly heterogeneous ($P = .02$ for Q test and 66% for I^2); therefore, a random-effects model was used. In addition, the summary odds ratio found in the meta-analysis shows a value of .97 (95% CI:0.49, 1.91). The test for overall effect shows a non-significant statistical correlation between both groups ($P = .93$).

To assess publication bias, we examined the funnel plot of the observed effect (Figure 3), which revealed asymmetry, suggesting publication bias.

TABLE 2 ROBINS-I risk-of-bias assessment

Studies/ First author	Confounding	Selection bias	Classification of intervention	Intended intervention	Missing data	Measurement of outcomes	Reported results	Overall
Azuh[22]	Serious	Moderate	Low	Low	No information	Low	Low	Serious RoB
Clark[23]	Low	Low	Low	Low	No information	Low	Low	Moderate RoB
Dickinson[24]	Low	Low	Low	Serious risk	No information	Low	Low	Serious RoB
Floyd[25]	Low	Low	Moderate	Low	Low	Low	Low	Moderate RoB
Fraser[26]	Low	Low	Moderate	Low	Low	Low	Low	Moderate RoB
Klein[27]	Low	Low	Low	Low	Low	Low	Low	Low of RoB
Titsworth[28]	Low	Low	Low	Moderate	Low	Low	Low	Moderate RoB

Abbreviation: ROBINS, Risk Of Bias In Non-randomized Studies.

4 | DISCUSSION

The identification of the physiological benefits of increased mobility in ICU patients has been trending in recent studies, although they are mostly focused on ventilated medical ICU wards. In fact, despite the interest aroused in the last decade in relation to EM in critical patients, there are only a few studies in which HAPIs are analysed. The present meta-analysis and systematic review only encountered seven articles investigating the effects of EMP in the prevention of PIs in patients with critical illness.

The qualitative analysis showed a positive trend towards the decrease in HAPI rates after the implementation of an EMP in only three included studies, while another three reported the opposite. Within the latter results, Dickinson et al[24] discussed some possible reasons why the EMP may have failed to reduce the PI rate. A possible explanation might lie in the clinical status of the patients; the post-implementation mobility group's overall health was probably worse as indicated by longer ICU and hospital LOS, although pre- and post-implementation mobility groups had similar Acute Physiology and Chronic Health Evaluation (APACHE) scores. In addition, Titsworth et al[28] related the lack of significant results with overall lower PI rates in both groups.

The meta-analysis carried out includes only five of the seven articles that meet the inclusion criteria. Clark et al,[23] Dickinson et al,[24] Klein et al,[27] and Titsworth et al[28] share the same methodology, a pre-post intervention design. The study carried out by Floyd et al[25] was included in the meta-analysis even though it was a matched pair design. When we analysed its design in depth, we observed similar methodological characteristics as the remaining quasi-experimental articles included, as it shows a pre-intervention compared with post-intervention group. The article by Fraser et al[26] was excluded because it used a different methodological design; while it is a two-group comparative study, it does not include pre- and post-intervention groups but instead has control and intervention groups. On the other hand, the study by Azuh et al,[22] even though it features a pre-post intervention design, does not provide quantitative data on the specific sample sizes of each group; therefore, a numerical meta-analysis is possible.

Although literature in this field is lacking, in a recent meta-analysis, Zang et al[30] studied the relationship between any type of EM or early rehabilitation compared with standard ICU care; there is no overlap in the literature with the present study because of different inclusion criteria. Zang et al only found four randomised control trials demonstrating the association between EM with a significantly lower ICU-HAPI incidence in the intervention group. They were evaluated with excellent homogeneity according to the Q test.

Our results highlight the improved outcomes related to pulmonary complications or pneumonias,[23,28] infections,[26-28] and deep vein thrombosis (DVT) [23,25] following the implementation of an EMP; however, the analysis of these clinical conditions needs caution as they require complex diagnostic procedures. Even though HAPI rates are usually associated with the

TABLE 3 Main qualitative outcomes of included studies

Study [Ref.] (year)	Early mobilisation protocol	Frequency/duration	HAPI data-recording sources	HAPI outcomes
Azuh et al[22] (2016)	Five-point mobility scale was developed by authors + Education (patient/family) about the need for mobility.	The daily duration and number of repetitions in each exercise is dependent on the level assigned by the evaluation scale.	Skin care nurse performed a visual skin assessment on admission and follow up daily until discharge. Data collection included number of all PI (stages 1-4, unstageable and deep tissue injury).	Pre-EMP: 9.2% Post-EMP: 6.1% ($P = .04$)
Clark et al[23] (2013)	Progressive early mobility programme adapted in literature[29] based on 4 levels.	Daily/Duration and number of repetitions depends on exercise and level.	Electronic record medical documentation.	Pre-EMP: 7% Post-EMP: 7.3% ($P = .77$)
Dickinson et al[24] (2013)	Developed the mobility protocol ("Moving and Grooving") with 3 phases + Family education.	Each exercise: 3 times/day; 10 repetitions.	A PI was defined as any ulcer documented in the medical record as a stage I or greater, according the NPUAP rating scale.	Pre-EMP: n = 20 (3.6%) Post-EMP: 41 (7.4%) ($P = .7$)
Floyd et al[25] (2016)	PMP adaptation,[11] comprised of 7 levels.	Daily/No duration data available.	Retrospective analysis of the electronic records of patients, codified by ICD-9.	Pre-EMP: 1 Post-EMP: 0 ($P = .313$)
Fraser et al[26] (2015)	EMP team designed the programme (with 4 phases) based on intervention described in literature + Education to the patient and family.	Once/day, Monday to Friday. 30 to 45 min/session	Data extracted from hospital's database. Followed the NDNQI guidelines to indicate the presence of HAPI	Routine Care group: 2 (3%) Mobility group:0 ($P < .001$)
Klein et al[27] (2015)	An early mobility protocol was developed by nurse clinician leaders with four progressive mobility milestones from 16 mobility levels.	Daily mobility for 13 days (initiated on the day of admission). The duration and number of repetitions in each exercise is dependent on the level assigned.	Data were defined based on National Quality Forum and other national quality sources (Centers for Disease Control) used to assess quality care.	Pre-EMP: 10 (3.8%) Post-EMP: 4 (1.1%) ($P = .026$)
Titsworth et al[28] (2012)	PUMP plus algorithm, developed and modified using existing evidence and guidelines.	Each step must be implemented at least 3 times/day and more frequently as tolerated. Progress each step from 30 to 60 min.	Data were collected by an Ostomy and Wound Liaison nurse during weekly "Skin Rounds." HAPI was categorised according to the NPUAP rating scale. The results presented are Stage II and higher.	Pre EMP: 2.6% ± 0.03 Post EMP: 4.6% ± 0.02 ($P = .22$)

Abbreviations: ICD-9, International Classification of Diseases; *NDNQI*, National Database of Nursing Quality Indicators; NPUAP, National Pressure Ulcer Advisory Panel; PMP, Progressive Mobility Protocol; PUMP, Progressive Upright Mobility Protocol.

analysis of other complications, also secondary to immobility, we could not find the same variables in all the studies; therefore, it is difficult to properly analyse the correlation between their presence and variation of HAPI rates.

Through all these articles, hospital LOS and ICU LOS show conflicting results. In general, ICU LOS[22,25,27,28] and hospital LOS[25,27,28] decrease with the implementation of an EMP. Although these outcomes are in agreement with most of the current literature, we found one

TABLE 4 Other relevant outcomes and adverse events

Study (Ref.) (year)	Other relevant outcomes	Adverse event related to EMP
Azuh et al[22] (2016)	MICU LOS decreased by 1 day after implementation of EMP ($P = .165$). Hospital readmission of ICU decreased from 17.1% to 11.5% ($P = .001$).	No adverse events reported (defined as fall, injuries, unwitnessed disconnections, and coincidental change in the patient's clinical status).
Clark et al[23] (2013)	• Decreased airway complications ($P = .001$). • Decreased cardiovascular complication ($P = .04$). • Decreased pulmonary complications ($P = .001$) and pneumonia rates ($P = .01$). • Decreased DVT and vascular ($P = <.001$).	No adverse event reported (categorised as involuntary or self-extubation, fall, cardiac event or respiratory event).
Dickinson et al[24] (2013)	Hospital and ICU LOS significant longer in the mobility group ($P = .002$ and $P \leq .001$).	No reported information.
Floyd et al[25] (2016)	Not statistically significant, but it shows clinical significance in a reduction in hospital LOS and ICU LOS, in ICU readmission rate and DVT.	No reported information.
Fraser et al[26] (2015)	• Decreased hospital readmission of ICU ($P < .001$). • Reduced falls, ventilator-associated events, and CAUTIs ($P < .001$). • Fewer delirium days ($P = .05$).	No adverse event (defined as fall, a cardiac event, an extubation, a decannulation, or a respiratory event).
Klein et al[27] (2015)	• Decreased ICU LOS by 45% ($P < .001$). • Decreased Hospital LOS by 33% ($P < .001$). • Decreased anxiety scores ($P = .03$). • Decreased bloodstream infection prevalence by 3% ($P = .015$).	No reported information.
Titsworth et al[28] (2012)	• Increased mobility by 300% ($P < .0001$). • Decreased NICU LOS by 13% ($P < .004$). • Decreased Hospital LOS ($P < .004$). • Decreased hospital-acquired infection by 60% ($P < .05$). • Decreased ventilator-associated pneumonias ($P < .001$). • Decrease days in restraints ($P < .05$).	No increase in adverse events (measured by fall or inadvertent line disconnections).

Abbreviations: CAUTIs, catheter-associated urinary tract infections; DRS, disability rating scale; DVT, deep vein thrombosis; ERBI, Early Rehabilitation Barthel Index.

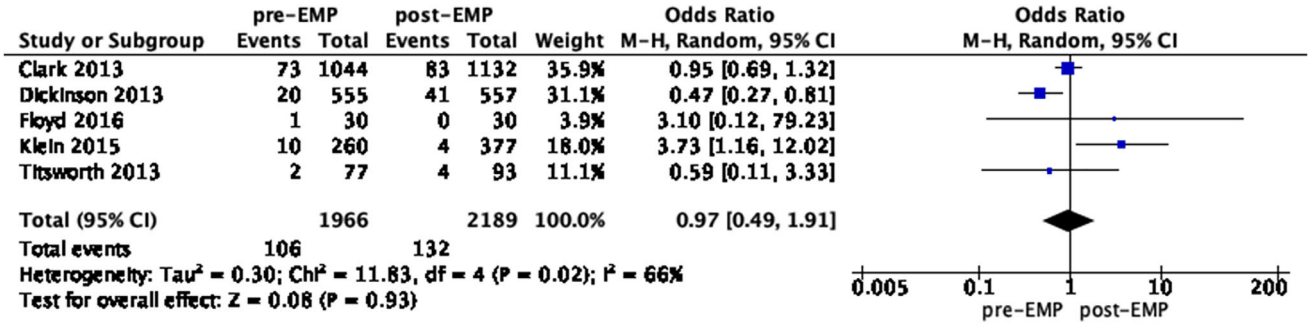

FIGURE 2 Forest plot for comparison: pre-early mobility programme (pre-EMP) vs post-EMP, outcome (event = PI). Statistical method: Mantel-Haenszel. Analysis model: random effects. Effect measure: odds ratio. 95% confidence interval

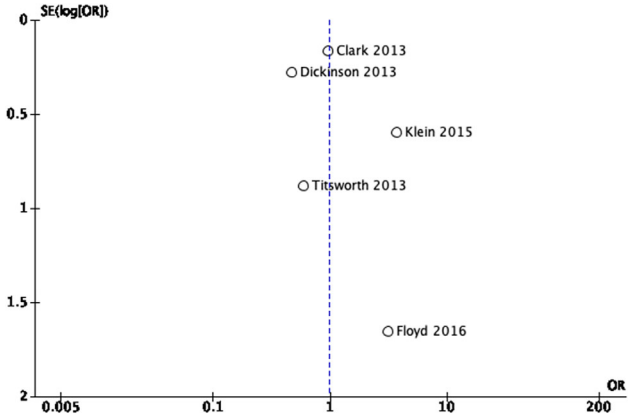

FIGURE 3 Funnel plots for quasi-experimental (pre-post) studies' meta-analysis

article, Dickinson et al,[24] that shows contradictory data, that is, an increase in the days of hospitalisation, which may be explained by the reasoning illustrated early in the discussion. It is worth mentioning that ICU readmissions after the implementation of the EMP follows a decreasing trend in all studies that measure this variable.[22,25,26]

Although it is true that there are certain barriers that complicate the implementation of an EMP, such as haemodynamic or pulmonary instability of patients, ICU culture of mobility, and lack of resources among clinicians,[31] the EMP is inherently safe according to a recent meta-analysis.[32] In fact, our systematic review agrees that EMP was safe in at least four of the seven articles included.

4.1 | Strengths and limitations

There were several potential limitations in this meta-analysis that should be acknowledged. First, the main limitation of this study was the lack of data; only seven articles met the inclusion criteria to answer the research question. Second, some of the included studies had a relatively low methodological quality, and our conclusion may be limited by this point. Third, substantial heterogeneity was identified in the included meta-analysis, which made the findings complicated to interpret. Likewise, some confounding factors, such as the definition of EM, timing of EM, and the differences in critically ill patients, may not be consistent across the included studies and account for the heterogeneity. In addition, the limitations associated with the variability in the definition of PI, the lack of description of the staging system used in some of the articles, and the differences between the inclusion criteria of the PI stage used in the calculation of the incidence or prevalence rates for each article must also be taken into account.

Finally, although this review improves the current lack of information, more studies are necessary to obtain conclusive evidence. Despite these limitations, this systematic review sought to analyse the available information to date related to how an EMP improves HAPI prevention.

5 | CONCLUSIONS

Existing literature cannot answer the review question. The discrepancies between studies and the scant number of them related to the assessment of PIs after the implementation of an EMP make the answer to whether EMP versus usual care is more effective in reducing the incidence of HAPI in ICU inconclusive. Thus, more large-scale and well-performed randomised control trials are needed to verify our results.

CONFLICT OF INTEREST

The authors declare no potential conflicts of interest.

AUTHOR CONTRIBUTIONS

Leticia Nieto-García and **Montserrat Alonso-Sardón:** Conceived and designed the study. **Leticia Nieto-García:** Developed the search strategy and performed the literature search. **Leticia Nieto-García** and **Montserrat Alonso-Sardón:** Carried out the study selection, extraction, and assessment of data for the systematic review. **Leticia Nieto-García** and **Montserrat Alonso-Sardón:** Wrote the first draft of the manuscript. **Adela Carpio-Pérez** and **María Teresa Moreiro-Barroso:** Contributed to interpretation of data and critical revision of the manuscript. **Montserrat Alonso-Sardón:** Supervised the study. All authors approved the final manuscript. All authors confirm the accuracy or integrity of the work.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

This study was reviewed and approved by the *Clinical Research Ethics Committee for Clinical Investigation of the University Hospital of Salamanca*. (Code: CEIm PI 2019 03208).

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APPENDIX A: SAMPLE SEARCH STRATEGY

The electronic search strategy was as follow:

1. "pressure ulcer" [MeSH Terms] OR "pressure injury" [All Fields]
2. "intensive care unit" [MeSH Terms] OR "ICU" [All Fields]
3. "early ambulation" [MeSH Terms] OR "early mobilization" [All Fields] OR "early mobility program" [All Fields] OR "early mobility protocol" [All Fields]
4. #1 AND #2 AND #3
5. "randomized controlled trials" [Publication type] OR "clinical trial" [Publication type] OR "systematic review" [Publication type] OR "meta-analysis" [Publication type]
6. #4 AND #5
7. Limit to English and Spanish language

TABLE B1 Different EMPs applied in each study

Author, year	EMP description	Intervention
Azuh et al, 2016	Five-point mobility scale devised by the authors based on previous experience and reviews.	• *Level 1 (bedrest)*: Reposition every 2 h, ROM based on restrictions every 4 h. • *Level 2 (edge of bed)*: Sitting bedside unsupported (up to 3 times per day for 5-30 min), initiate assisted or active exercises, assistance with activities of daily living. • *Level 3 (stand to chair)*: Transfer from bed to chair. • *Level 4*: Exercise while seated. Walk 3 times per day with assistance. • *Level 5*: Independent ambulation and stationary bicycle.
Clark et al, 2013	Adapted progressive mobility program.[29]	• *Level 1*: repositioning every 2 h and daily routine passive ROM. • *Level 2*: active-assisted to active exercises. • *Level 3 y 4*: Use of weights and resistance bands.
Dickinson et al, 2013	Developed a new EMP: "Moving and Grooving."	• *Phase 0*: active/passive ROM (3×/day, 10 repetitions), HOB elevated 30° to 45° or reverse Trendelenburg, reposition (every 2 h), CLR (18-24 h per day). • *Phase 1*: Phase 0 + chair position or OOB with sling (3×/day) and dangling (3×/day). • *Phase 2*: Resisting ROM (3×/day, 10 repetitions), HOB elevated 30° to 45° and reposition (every 2 h), standing (3×/day) and walking (3×/day).
Floyd et al, 2016	Progressive Mobility Protocol (PMP) adapted from Zomorodi.[11]	• *Level 1*. Active/passive ROM in bed, HOB > 30°. • *Level 2*. Sitting on edge of bed. • *Level 3*. Stand up and lateral side step along the bed. • *Level 4*. OOB to chair via stand pivot transfer. • *Level 5*. Ambulation < 50 ft. • *Level 6*. Ambulation 100 ft. • *Level 7*. Ambulation > 100 ft.

(Continues)

TABLE B1 (Continued)

Author, year	EMP description	Intervention
Fraser et al, 2015	Designed the EMP based on interventions described in the literature.	• *Phase 1*: Passive ROM and repositioning every 2 h. • *Phase 2*: Sitting on edge of bed and standing. • *Phase 3*: Transferring from bed to chair. • *Phase 4*: Ambulation.
Klein et al, 2015	Created an early mobility protocol with four progressive mobility milestones from 16 mobility levels.	*Level 1*. 1. Bed rest without passive ROM. 2. Bed rest with passive ROM. 3. Bed rest with active ROM. 4. Turn and position every 2 h. 5. HOB routinely < 30°. 6. HOB elevated > 30°. 7. CLR. *Level 2* (HOB elevated and dangle at bedside). 1. HOB elevated ≥45° o < 65° × 60 min. 2. HOB elevated ≥45° o < 65° + legs in a dependent position × 60 min. 3. HOB elevated ≥65° + legs in a dependent position x 60 min (beach chair). 4. Meets ≠ 9 o 10 but for > 60 min. 5. Dangle with assistance. *Level 3* (stand at bedside). 1. Stand at side of bed. 2. Stand and pivot to chair. *Level 4* (walking). 1. Walk with assistance. 2. Walk independently.
Titsworth et al, 2012	Developed a PUMP plus algorithm (Progressive Upright Mobility Protocol).	• *Step 1*: HOB elevated at 45°. • *Step 2*: HOB elevated at 45° plus legs in dependent position (partial chair mode/cardiac chair). • *Step 3*: HOB elevated at 45° plus legs in full dependent position (full bed chair mode/cardiac chair). • *Step 4*: HOB elevated at 65° plus legs in full dependent position and feet on floor; standing in place. • *Step 5*: Initial stand position/pivot and into chair. • *Step 6 (plus)*: Transfer standing from bed to chair for 2 to 3 meals with sitting time not to exceed 45 min. • *Step 7 (plus)*: Ambulate within room using assistive devices and extra personnel PRN (goal = 20 ft). • *Step 8 (plus)*: Ambulate within hallway using assistive devices and extra personnel PRN (goal = 50 ft). • *Step 9 (plus)*: Ambulate within hallway using assistive devices and extra personnel PRN (goal = 100 ft). • *Step 10 (plus)*: Ambulate 150 ft with contact guard (hands on only for balance) or personal supervision/assistance (coaching only). • *Step 11 (plus)*: Ambulate without coaching or supervision, may use device if necessary.

Abbreviations: CLR, continuous lateral rotation; HOB, head-of-bed elevation; OOB, out of bed; PRN, as needed; ROM, range of motion.

Artículo Segundo

Clinical burden of inpatient wound care in Internal Medicine Units during first wave of COVID-19 outbreak.

Carga clínica de la atención de heridas de los pacientes hospitalizados en las Unidades de Medicina Interna durante la primera oleada de la crisis COVID-19.

Objetivo: Explorar la carga clínica y el perfil epidemiológico de los pacientes hospitalizados con registro de uno o varios episodios de herida crónica durante la primera ola de COVID-19.

Metodología: Se realizó un estudio retrospectivo y observacional para analizar los episodios de cuidados de heridas en pacientes hospitalizados en el Servicio de Medicina Interna del Hospital Universitario de Salamanca (España) durante el periodo de la primera ola de la pandemia de COVID-19, establecido desde el 1 de marzo al 1 de junio de 2020. Se utilizó como fuente de datos los registros de los Informes de Cuidados de Enfermería del programa Gacela Care® y los Informes Clínicos de Alta. Los pacientes incluidos cumplían los siguientes criterios: edad ≥18 años y estancia hospitalaria ≥1 día en el Servicio de Medicina Interna. Se excluyeron las heridas quirúrgicas y traumáticas y la población pediátrica.

Resultados. Se incluyeron un total de 116 pacientes y 216 episodios de heridas crónicas. La prevalencia global de herida crónicas fue del 7.6% y la incidencia del 2.8% en el Servicio de Medicina Interna. Predominaron las LPP con un riesgo significativamente mayor en los pacientes COVID-19 (OR=2.0; IC 95%, 1,1-4.0; p=0.042). Se observaron diferencias significativas en el estadio: el 83,2% de las heridas en los pacientes COVID-19 estaban en estadio I-II frente al 67,8% de los no COVID-19 que, sin embargo, presentaban el doble de probabilidad de situarse en estadio III-IV (OR=2,3; IC 95%, 1,2-4,5; p=0.009). Por otro lado, los pacientes con diagnóstico COVID-19 presentaron una mayor estancia media hospitalaria y una mayor tasa de ingreso en la UCI. No se observaron diferencias en la tasa de letalidad.

Conclusiones: Este estudio establece la necesidad de asegurar una evaluación protocolizada y la implementación de medidas preventivas entre la población anciana, los pacientes con comorbilidades asociadas y los pacientes de UCI.

Original Investigation

Clinical Burden of Inpatient Wound Care in Internal Medicine Units During the First Wave of COVID-19 Outbreak

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ABSTRACT

Objective: To explore the clinical burden and epidemiologic profile of hospitalized patients with wounds during the first wave of COVID-19.

Methods: A retrospective and observational study was conducted to analyze the inpatient episodes of wound care in the University Hospital of Salamanca (Spain) during the initial COVID-19 crisis from March 1, 2020, to June 1, 2020. Data were collected from nursing care reports and clinical discharge reports. Included patients were 18 years or older, had a hospital length of stay of 1 day or longer, and were hospitalized in an internal medicine unit. Surgical and traumatic wounds and pediatric patients were excluded.

Results: A total of 116 patients and 216 wounds were included. The overall wound prevalence was 7.6%, and incidence was 3.5% in the internal medicine units. Pressure injuries (PIs) were the most common wound type, and patients with COVID-19 had significantly higher PI risk (odds ratio [OR], 2.0; 95% confidence interval [CI], 1.1–4.0; $P = .042$). Significant differences in PI staging were noted: 83.2% of wounds in patients with COVID-19 were stages I-II versus 67.8% in patients without COVID-19; the probability of stage III-IV PIs among patients without COVID-19 was doubled (OR, 2.3; 95% CI, 1.2–4.5; $P = .009$). The probability of acute wounds tripled in patients with COVID-19 (OR, 3.7; 95% CI, 2.1–6.6; $P < .001$). Patients with COVID-19 also had longer mean hospital stays and higher ICU admission rates. No case fatality rate differences were observed.

Conclusions: In this context of clinical practice, protocolized assessment and implementation of preventive measures must be ensured among older adult populations, patients with associated comorbidities, and ICU patients.

Keywords: COVID-19, internal medicine units, length of stay, pressure injury, skin injuries, wounds

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INTRODUCTION

The COVID-19 pandemic has pushed the limits of healthcare systems in many countries at all levels of care. According to the situational report by the World Health Organization, which revealed 239,801 confirmed cases of COVID-19 and 29,045 deaths as of June 2020, Spain is one of the European countries most severely affected by the COVID-19 pandemic.[1]

Chronic wounds fail to evolve through the normal phases of wound healing in a timely manner and may include vascular ulcers (eg, venous and arterial ulcers), diabetic foot ulcers, and pressure injuries (PIs), among others.[2] These wounds, especially PIs, are preventable, but remain a challenging problem in hospitalized patients and are associated with high morbidity, mortality, infection, and economic cost.[3–7]

The COVID-19 pandemic may lead to increased risks related to the appearance or aggravation of wounds because of a lack of health professionals and high workloads, lack of support surfaces, the high incidence of patients with COVID-19 needing hospitalization, and the pathology of COVID-19 and its comorbidities. To assess the healthcare performance of chronic wound treatments, the first step is to develop effective prevention and therapeutic strategies to improve future care crisis protocols. Thus, the authors performed a single-site retrospective study of patients hospitalized in internal medicine units in the Salamanca University Hospital Complex (province of Salamanca, Spain) during the COVID-19 crisis who exhibited a skin wound episode to identify the wound prevalence and epidemiologic profile of these patients.

METHODS

Study Design and Setting

A descriptive longitudinal retrospective study was performed following the STROBE (Strengthening the

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Reporting of Observational Studies in Epidemiology) statement.[8] This study was conducted in the Salamanca University Hospital Complex (Complejo Asistencial Universitario de Salamanca; CAUSA, in Spanish) in the province of Salamanca, Spain. The CAUSA hospital complex is a public, tertiary hospital that includes five institutions (Clinical Hospital, Virgen de la Vega Hospital, Virgen del Castañar Hospital, Montalvos Hospital, and the Specialized Centre of Ciudad Rodrigo), with 903 acute beds, 110 medium-long stay beds, and 45 hospital medical services. It provides healthcare coverage to 331,048 inhabitants.[9]

During the study period, many units turned into COVID-19 wards because of the need for beds to hospitalize patients with COVID-19. This high flow of hospitalizations forced healthcare organizations to adjust clinical and structural resources. For this reason, CAUSA created a response plan to COVID-19 that included, among other measures, the restructuring of the Clinical Hospital and Montalvos Hospital as COVID reference areas (new COVID units were opened progressively to meet the needs and number of patients admitted), whereas Virgen de la Vega Hospital was a non-COVID hospital; the other rural hospitals transferred their health professionals and material resources to cover the needs of these three hospitals.

Data Source and Data Collection

Two sources of information were used to collect the relevant information on patients: nursing care reports (NCRs) and clinical discharge reports. Two investigators/researchers reviewed both records of hospitalized patients who had one or more episodes of wound care during their hospital stay at the Internal Medicine Units of the Salamanca University Hospital Complex. Data were collected between March 1, 2020, and June 1, 2020, the most critical period of hospitalizations and hospital overload of the first wave of COVID-19 in Salamanca.

The researchers first extracted data on wound care episodes from NCRs though the electronic nursing healthcare management program Gacela-Care, which is a software program used to record nursing interventions and care plans in hospitalized patients. This health information system uses the "episode of care" as the unit of record, which is defined as "the process of care for an illness or demand made by the patient, which begins with the first contact with the health services and ends with the last contact related to the specific episode." The researchers then reviewed the clinical discharge report corresponding to the previously selected episodes to extract complete patient clinical information.

The following data were collected: (1) demographic variables, such as sex, age, and hospitalization unit; (2) clinical variables and comorbidities: principal diagnosis and secondary diagnosis/other diagnosis, reason for discharge, hospital length of stay, mortality; (3) variables related to the specific characteristics of the wound, such as etiology (vascular ulcer, diabetic ulcer, PI, moisture-associated skin damage [MASD] and oncology process), number of wounds per patient, location, wound origin (domicile, internal medicine unit, ICU, or primary healthcare), and stage graded from I to IV according to tissue damage and based on the National Pressure Ulcer Advisory Panel staging system.[10] Data were collected and analyzed by two analysts. Patients were grouped according to the principal diagnosis (COVID-19 group and non-COVID-19 group), and demographic and clinical characteristics of both groups were compared.

Participants and Sample Size

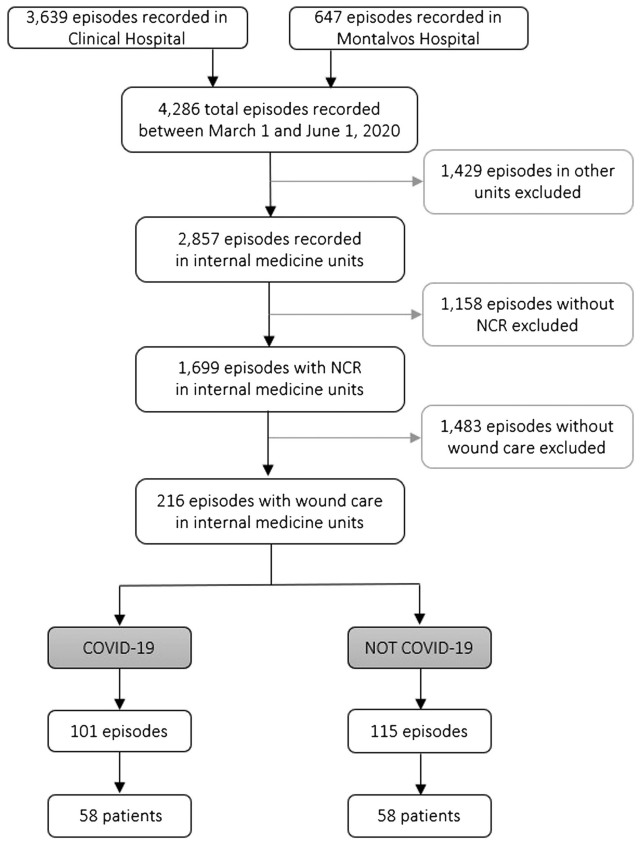
Participant inclusion criteria were as follows: adult patients (≥18 years old) hospitalized for more than 24 hours in internal medicine units during the period March 1, 2020, to June 1, 2020, with recorded episodes of skin injuries or chronic wounds that received nursing care. The episodes included the following diagnoses: PI, vascular ulcer (arterial or venous ulcer), MASD, neuropathic diabetes foot, and neoplastic lesions. Exclusion criteria were as follows: episodes of surgical or traumatic wounds, pediatric population, and hospitalization in units other than internal medicine.

From March 1, 2020, to June 1, 2020, a total of 4,286 wound episodes were recorded in Salamanca University Hospital Complex, 2,857 of which were recorded in the internal medicine units. Of these, 1,699 episodes were reported in the NCR, and 216 wound episodes required nursing care during the first peak of SARS-CoV-2 infections. These 216 episodes corresponded to 116 patients (Figure 1).

Statistical Analyses

Categorical variables were expressed as frequencies (n) and percentages (%). Continuous variables were described with mean and SD, unless the distribution was not normal, in which case they were expressed as median and interquartile range (Q3-Q1). The Shapiro-Wilk test was used to verify normality. In the bivariate analysis, a χ^2 test was used to compare associations between demographics and clinical categorical variables of patients with and without COVID, and the measured outcome was expressed as the odds ratio (OR) together with the 95% confidence interval (CI) for OR. Continuous variables were compared with Student *t* test or the Mann-Whitney *U* test for two groups, depending on their normal or nonnormal distribution. The authors used analysis of variance to analyze the influence of independent nominal variables on a continuous dependent variable. $P < .05$ was considered statistically significant. Data analysis was performed using SPSS version 26.0 (IBM, Armonk, New York).

Figure 1. FLOW DIAGRAM SHOWING EPISODES RECORDED



Abbreviation: NCR, nursing care report.

Ethics Statement

The database supporting the findings of this study is available from the authors. The study was approved by the Ethics Committee of the University Hospital of Salamanca (code: PI 2019 03 208). All data were kept confidential and processed anonymously in accordance with the requirements of Law 3/2018 of 5 December on the Protection of Personal Data and Guarantee of Digital Rights.[11]

RESULTS

Prevalence and Incidence of Wound Episodes

A total of 216 wound episodes required nursing care in the internal medicine units from March 1, 2020, to June 1, 2020; 266 wound episodes were recorded during the same time period in the year prior to the pandemic (from March 1, 2019, to June 1, 2019). The prevalence of wound episodes during the first wave of COVID-19 pandemic was 7.6% (216/2,857) in the internal medicine units and 5% (216/4,286) in Salamanca University Hospital Complex. Of these, 108 episodes (50%) corresponded to injuries prior to hospital admission, and 97 episodes (44.9%) were injuries that occurred during the hospital stay (for 11 episodes, the site and time of appearance are unknown). The incidence of wound episodes during the first peak of infection was 3.5% in the internal medicine units. These 216 episodes corresponded to 116 patients: 101 episodes occurred in 58 patients with COVID-19, and 115 episodes occurred in patients without COVID-19. Only two patients required hospital readmission during the study period for SARS-CoV-2 transmission during their first hospital stay.

Patient Characteristics

Of the total 116 patients, 51 (44%) were men, and 65 (56%) were women. Mean age was 82 (SD, 11.4) years (range, 38–100 years; median 84 years, interquartile range 89–76 years). No statistically significant age differences were observed between men and women (80.0 [SD, 11.6] years vs 83.6 [SD, 11.0] years, respectively; $P = .094$).

In half of the recorded patients, the principal diagnosis was SARS-CoV-2 infection. Among patients without COVID-19, the most common principal diagnoses were sepsis, septic shock, and bacteremia (18 patients). More than half of the sample (55.2%) had only one episode of wound care during their hospital stay at the internal medicine units. Table 1 shows the global data describing the cohort of patients.

COVID-19 Versus non-COVID-19 Wound Episodes

Table 2 compares the variables of the groups with and without COVID-19. No significant differences in sex ($P = .853$) or mean age ($P = .138$) were observed across the patient groups.

Overall, PIs were the most common wound type in both study groups (85.1% COVID-19 vs 73.9% non-COVID-19). Patients with COVID-19 had a significantly higher PI risk (OR, 2.0; 95% CI, 1.1–4.0; $P = .042$), whereas venous ulcer occurrence was twice as high among patients without COVID-19 (13.9% vs 6.9%; OR, 2.2; 95% CI, 0.8–5.5; $P = .097$). There were significant differences in wound staging between the groups: 83.2% of skin ulcers in patients with COVID-19 were stages I and II versus 67.8% in the non-COVID-19 group; thus, the probability of stage III and IV skin ulcers among patients without COVID-19 diagnosis is doubled (OR, 2.3; 95% CI, 1.2–4.5; $P = .009$). In patients with COVID-19, 59 episodes (58.4%) were acute wounds (occurred during their hospital stay); in contrast, 39 episodes (33.9%) were acute wounds in the non-COVID-19 group ($P < .001$). Thus, the risk or probability (OR) of acute wounds was three times higher in patients with COVID-19 during the first wave of the pandemic in the internal medicine units at this hospital (OR, 3.7; 95% CI, 2.1–6.6; $P < .001$). As shown in Figure 2, the sacral region (34.7% vs 29.6%) and heel (29.7% vs 29.6%) were the most common locations.

Table 1. PATIENT CHARACTERISTICS (N = 116)

Qualitative Variables	n (%)
Sex	
Male	51 (44.0)
Female	65 (56.0)
Age, y	
<60	2 (1.7)
60–69	18 (15.5)
70–79	18 (15.5)
80–89	50 (43.1)
90–99	26 (22.4)
100	2 (1.7)
No. episodes per patient	
1	64 (55.2)
2	29 (25.0)
≥3	23 (19.8)
Principal diagnosis	
COVID-19	58 (50.0)
Other diagnosis	58 (50.0)
Sepsis, septic shock, bacteremia	18 (15.5)
Pneumonia, respiratory infection	14 (12.1)
Urinary tract infection	8 (6.9)
Chronic renal disease	5 (4.3)
Neoplasm diagnosis	7 (6.0)
Heart failure	3 (2.6)
Digestive disease	3 (2.6)
Stay in critical care unit	14 (12.1)
Case fatality rate	19 (16.4)

Quantitative Variables	Mean (SD)	Median (Interquartile Range)	Range
Age, y	82.0 (11.4)	84 (89–76)	38–100
No. episodes per patient	1.9 (1.3)	1 (2-1)	1–7
Hospital stay, d	21.3 (14.1)	19 (29-11)	1–67

Mean hospital stay was significantly longer in patients with COVID-19 (26.0 [SD, 14.1] days vs 16.8 [SD, 12.6] days; $P < .001$), and 17.2% of patients with COVID-19 required intensive care versus 6.9% in the non-COVID-19 group ($P = .088$). No differences were observed in the case fatality rate (17.2% vs 15.5%).

DISCUSSION

Wound care is one of many areas that have been seriously affected by the global health crisis related to the COVID-19 pandemic. Recent studies that surveyed patients and healthcare professionals evidence a negative impact of COVID-19 in patients with chronic wounds in term of diagnostics, follow-up, and access to specialists.[12,13] In the current study, the authors aimed to identify the profile of patients in need of wound care during the months of the first wave of COVID-19 in Spain, specifically in the province of Salamanca, one of the most affected by the pandemic with 31,998 accumulated confirmed patients as of May 2021.[14]

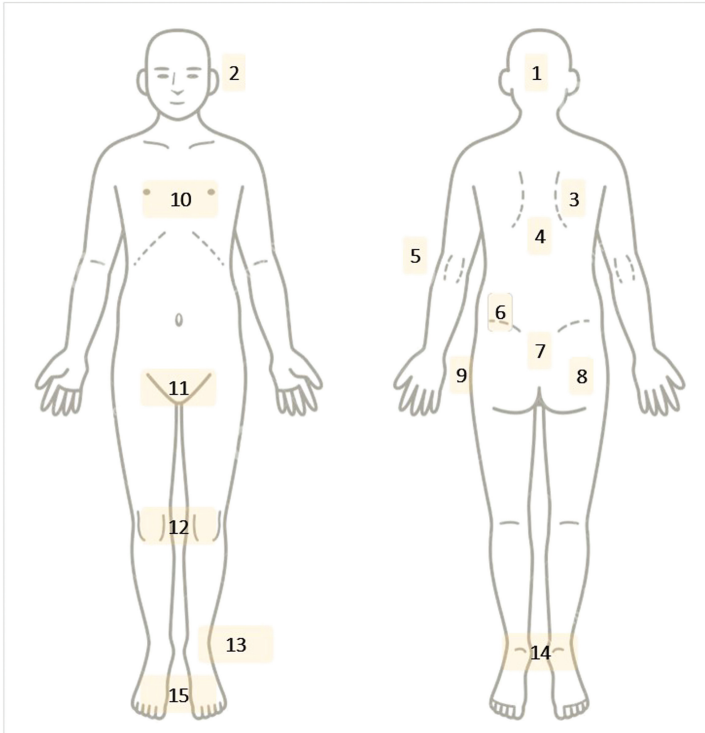
In their fifth national study in 2017, the National Advisory Group for the study of Pressure Ulcers and Chronic Wounds (original Spanish name: Grupo Nacional para el Estudio y Asesoramiento en Úlceras por Presión y Heridas Crónicas) estimated that global overall prevalence of dependence-related skin lesions in Spanish hospitals was 8.7%; PIs were the most frequently occurring, followed by combined injuries, moisture-associated lesions, friction, and skin tears.[15] In contrast, the current study found a lower prevalence rate (7.6%) despite including a broader etiologic spectrum of wound care episodes, which was unexpected for a period of care

Table 2. COMPARING VARIABLES BETWEEN GROUPS

Variables	COVID-19 (n = 58)	non-COVID-19 (n = 58)	P[a]
Patient characteristics			
Male-to-female ratio	27/32	26/33	.853
Age, mean (SD), y	80.4 (13.1)	83.6 (9.1)	.138
No. episodes per patient (SD)	1.8 (1.2)	2.0 (1.4)	.393
Hospital stay, mean (SD), d	26.0 (14.1)	16.8 (12.6)	<.001
Patients with stay in critical care unit	10 (17.2)	4 (6.9)	.088
Case fatality rate	10 (17.2)	9 (15.5)	.802
Wounds	n = 101	n = 115	
Pressure injury	86 (85.1)	85 (73.9)	.042
Venous ulcer	7 (6.9)	16 (13.9)	.097
Moisture-associated skin damage	4 (4.0)	7 (6.1)	.478
Arterial ulcer	2 (2.0)	1 (0.9)	—
Tumor	1 (1.0)	2 (1.7)	—
Neuropathic diabetic foot ulcer	1 (1.0)	4 (3.5)	—
Stage			
I	27 (26.7)	26 (22.6)	
II	57 (56.4)	52 (45.2)	
III	13 (12.9)	17 (14.8)	
IV	4 (4.0)	20 (17.4)	.014
Wounds by type and site			
Acute wounds	59 (58.4)	38 (33.0)	
Actual unit	26 (25.7)	15 (13.0)	
Critical care unit	15 (14.9)	7 (6.1)	
Other unit	18 (17.8)	16 (13.9)	
Chronic wounds	32 (31.7)	76 (66.1)	
Home	4 (4.0)	42 (36.5)	
Social and healthcare center	28 (27.7)	34 (29.6)	
Not recorded	10 (9.9)	1 (0.9)	<.001

[a]Statistical significance level $P < .05$.

Figure 2. LOCATION OF WOUNDS IN PATIENTS BY COVID-19 DIAGNOSIS



	Location	COVID-19	NOT COVID-19
1	Head (occiput)	1 (1%)	-
2	Ears	2 (2%)	-
3	Scapulae	2 (2%)	-
4	Spine/back	2 (2%)	3 (2.6%)
5	Elbows/arm	8 (7.9%)	2 (1.7%)
6	Iliac crest	-	1 (0.9%)
7	Sacrum/coccyx	35 (34.7%)	34 (29.6%)
8	Buttock	6 (5.9%)	7 (6.1%)
9	Trochanter	4 (4%)	7 (6.1%)
10	Breasts (female)	-	1 (0.9%)
11	Genitalia (male)	-	1 (0.9%)
12	Knees/tibia/leg	7 (6.9%)	15 (13%)
13	Malleolus	-	2 (1.7%)
14	Heels (calcaneus)	30 (29.7%)	34 (29.6%)
15	Toes (metatarsals)	4 (4%)	6 (5.2%)
16	Other	-	2 (1.7%)

overload and high rate of hospital admissions. In fact, the rates were lower than those reported in NCRs collected during the same time period the previous year. Accordingly, results must be interpreted cautiously; wounds may have been underreported because health professionals prioritized healthcare over registration tasks due to lack of time and resources.

In most cases, COVID-19 has a mild clinical course,[16] but people of advanced age and/or those with underlying comorbidities may have serious complications.[17,18] Several meta-analyses have found hypertension, cardiovascular diseases, diabetes mellitus, chronic obstructive pulmonary disease, and chronic kidney disease among the major risk factors for patients hospitalized with COVID-19.[19,20] These chronic conditions also factor into risks of wound development and may hinder the healing process due to their association with conditions such as immobilization, tissue ischemia, malnutrition, and so on.[21–24]

The profiles of both groups included in the current study corresponded to patients with a mean age older than 80 years who presented several clinical situations or comorbidities in addition to the main admission diagnosis. Given the demographic characteristics of the local population with a high average age and life expectancy, it was observed that the COVID-19 group reflected the most affected population of the first wave in this province. Among patients without COVID-19, the main admission diagnoses were related to sepsis and pneumonia or respiratory infections, followed by urinary tract infections. It should be noted that during this time, outpatient consultations and scheduled interventions were suspended, and internal medicine units were almost exclusively dedicated to patients with COVID-19. Therefore, the rest of the pathologies without admission criteria were treated through alternatives such as primary care or telemedicine.

Regarding mortality, the meta-analysis by Bonanad et al[17] performed with national reports on May 7, 2020, indicates that the global mortality in patients with COVID-19 is approximately 12.10%, but higher rates are observed in patients older than 80 years, whose risk may be six times higher than that of younger patients. In the current study, no significant differences in mortality rates were found between groups, perhaps because of the homogeneity of age and clinical characteristics in both groups.

Recent research has shown that a high percentage of patients hospitalized with COVID-19 require mechanical ventilation systems and ICU care.[25] The present data show significant differences in this regard, with longer hospital length of stay and more ICU admissions in the COVID-19 group versus the non-COVID-19 group. As reported in the literature, critically ill patients acquire ICU-specific risk factors related to the development of PIs—a common situation among patients with COVID-19—such as limited mobility/activity, vasopressor infusion, and poor perfusion.[26]

No statistical differences were found in the number or location of wounds between groups; sacral region and heels were the most common wound locations in both groups. However, statistical differences were observed in the wound staging: 32.2% of wounds were stage III or IV in the non-COVID-19 group, whereas only 16.9% of wounds were stage III or IV in the COVID-19 group. Moreover, it is important to highlight the statistical differences regarding the time of appearance of the wounds. The non-COVID-19 group presented higher percentages of wounds prior to hospitalization, originating at home or at social-health centers, whereas in patients with COVID-19, wounds were more frequently acquired during the hospital stay. However, a high number of wounds in both groups had an unknown moment of appearance, which may indicate a deficit in their assessment or healthcare providers' lacking time to correctly complete documentation.

During the first wave of the pandemic, given the lack of knowledge regarding COVID-19 and what it could entail, no specific plan was established for the follow-up and treatment of chronic wounds; instead, efforts were focused on treating the new disease. For this reason, the established plans for the prevention and treatment of chronic wounds at University Hospital of Salamanca, both in the ICU and in the conventional hospitalization wards, were maintained, but no new plan was established.[27] Thus, one purpose of the current research was to report whether there are significant differences between wound care in patients with SARS COV-2 infection and those without, in order to establish different criteria, if necessary.

Limitations, Strengths, Implications for Practice, and Recommendations for Future Studies

The main strength of the study is that it is the first to quantify and analyze the clinical impact of wound care in hospitals overburdened by the COVID-19 pandemic. Because COVID-19 is a new disease and appeared in the form of a global pandemic, its effect on wound care was unknown; this descriptive research sets the basis for future studies.

Some limitations of this research should be considered. First, this study was limited by the nature of its retrospective design, so it is impossible to establish causality. Second, although hospital protocols normalize nursing activity on prevention, communication, and follow-up of wounds, it is possible that some episodes were poorly or incompletely documented because of the high workloads and lack of nursing professionals during the worst months of the pandemic. Third, the staging system used by the Gacela Care program, based on the National Pressure Ulcer Advisory Panel/European Pressure Ulcer Advisory Panel system for PIs, is the same for all types of wounds (vascular, neoplastic, MASD, etc). Therefore, the fact that the program allows the recording of the four stages according to the extent of tissue damage without distinguishing etiology may indicate a bias in its analysis.

CONCLUSIONS

During the first wave of the COVID-19 pandemic, the requirements for wound care mainly related to older adult populations, patients with associated comorbidities, and ICU patients. Therefore, it is important for nursing professionals to ensure the implementation of preventive measures, skin assessment, and follow-up. ●

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Artículo Tercero

PLOS ONE

Are there differences between COVID-19 and non-COVID-19 inpatient pressure injuries? Experiences in Internal Medicine Units.

¿Existen diferencias entre las lesiones por presión en pacientes hospitalizados con COVID-19 y sin COVID-19? Experiencias en Unidades de Medicina Interna.

Objetivo: Describir y comparar las características epidemiológicas y clínicas de las LPP en pacientes con COVID-19 y en pacientes ingresados por otras causas en el Servicio de Medicina Interna del CAUSA (Salamanca, España) durante la primera ola de la pandemia por COVID-19.

Metodología: Estudio descriptivo longitudinal retrospectivo que analiza los episodios de LPP en pacientes mayores de 18 años hospitalizados más de 24 horas en el Servicio de Medicina Interna del CAUSA durante la primera ola de la pandemia de COVID-19 (1 de marzo de 2020 hasta el 1 de junio de 2020).

Resultados. Se estudiaron 101 pacientes ingresados y 171 episodios. La prevalencia de LPP fue del 6% y la incidencia acumulada del 2,9% durante la primera ola de COVID-19. La estancia media hospitalaria fue significativamente más larga en el grupo de pacientes con diagnóstico de COVID-19 ($p<0,001$). El riesgo de lesiones agudas fue cuatro veces mayor en el grupo de pacientes COVID-19 ($p<0,001$). Las localizaciones más comunes fueron el sacro y los talones. En los pacientes COVID-19 se encontró una asociación significativa entre las LPP adquiridas en el hospital y comorbilidades como la diabetes mellitus y la hipertensión arterial.

Conclusiones: Los pacientes COVID-19 tienden a presentar un mayor número de LPP agudas, principalmente de origen hospitalario, en comparación con el perfil del grupo no-COVID-19.

PLOS ONE

RESEARCH ARTICLE

Are there differences between COVID-19 and non-COVID-19 inpatient pressure injuries? Experiences in Internal Medicine Units

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Abstract

Background

Pressure Injuries (PIs) are major worldwide public health threats within the different health-care settings.

Objective

To describe and compare epidemiological and clinical features of PIs in COVID-19 patients and patients admitted for other causes in Internal Medicine Units during the first wave of COVID-19 pandemic.

Design

A descriptive longitudinal retrospective study.

Setting

This study was conducted in Internal Medicine Units in Salamanca University Hospital Complex, a tertiary hospital in the Salamanca province, Spain.

Participants

All inpatients ≥18-year-old admitted from March 1, 2020 to June 1, 2020 for more than 24 hours in the Internal Medicine Units with one or more episodes of PIs.

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Competing interests: The authors have declared that no competing interests exist.

Results

A total of 101 inpatients and 171 episodes were studied. The prevalence of PI episodes was 6% and the cumulative incidence was 2.9% during the first-wave of COVID-19. Risk of acute wounds was four times higher in the COVID-19 patient group ($p<0.001$). Most common locations were sacrum and heels. Among hospital acquired pressure injuries a significant association was observed between arterial hypertension and diabetes mellitus in patients with COVID-19 diagnosis.

Conclusion

During the first wave of COVID-19, COVID-19 patients tend to present a higher number of acute wounds, mainly of hospital origin, compared to the profile of the non-COVID group. Diabetes mellitus and arterial hypertension were identified as main associated comorbidities in patients with COVID-19 diagnosis.

1. Introduction

Since the outbreak of the novel coronavirus (2019-nCoV) in December 2019 in Wuhan, China, confirmed cases have appeared in countries around the world with a serious impact in Spain, where the situational reports of World Health Organization (WHO) revealed 239 801 confirmed cases of COVID and 29 045 deaths as of June 2020 [1], period considered to be the first wave in this country.

National Pressure Injury Advisory Panel (NPIAP) points out that COVID-19 crisis has also brought significant changes in the implementation of preventive measures of pressure injuries (PI) [2], especially in the middle of the pandemic, since some patients spend prolonged stays in Intensive Care Unit (ICU) or other medical services. During the COVID-19 pandemic, several extrinsic factors associated with its propensity to overwhelm health care systems should be taken into consideration as risk factors of PI formation: lack for appropriate equipment (support surfaces, mattresses) or skin and wound care products, respiratory isolation and understaff of nursing professionals.

The last European Pressure Ulcer Advisory Panel (EPUAP) Virtual Meeting in September 2020 [3] highlighted etiology factors linked to development of PIs such as COVID-19 virus pathophysiology (systemic coagulopathy, hypercoagulation, microvascular occlusion) [4–7], the role of inflammation, limited reposition caused by hemodynamic instability or profound hypoxia, use of prone position as adjuvant therapy and the increase in the use of medical device-related PIs (tracheostomy tubes, feeding tubes and oxygen delivery devices). Finally, survivors of severe cases have required prolonged recovery hospital stay due to severe weakness, comorbidities related to COVID-19 or chronic diseases.

We performed a single institutional study in hospitalized patients who developed one or more episodes of PIs during the first wave of the COVID-19 pandemic in the Internal Medicine Units to describe and compare epidemiological and clinical features of acute or chronic PIs in COVID-19 patients and patients admitted for other causes.

2. Material and methods

2.1. Study design, setting and data source

A descriptive longitudinal retrospective study was performed at the Salamanca University Hospital Complex *(Complejo Asistencial Universitario de Salamanca "CAUSA", in Spanish)*, Spain. This is a public and tertiary hospital with 903 acute beds, 110 medium-long stay beds and 45 hospital medical services. It provides healthcare cover to 331.048 inhabitants (Salamanca population January 1, 2020; INE: https://www.ine.es/).

We defined the first wave of COVID-19 pandemic in Spain as the period from March 1, 2020 to June 1, 2020. A total of 4289 individuals were confirmed COVID-19 cases in the Salamanca Health Area. Of these, 1196 cases were hospitalized in the Internal Medicine Units of Salamanca University Hospital and 363 died [8]. The need for beds due to the high flow of patients admitted during the study period turned many Units into COVID-19 wards.

This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline. Two investigators/researchers reviewed the Nursing Care Reports (NCR) and Clinical Discharge Reports (CDR) records of admitted subjects who had one or more PIs during their hospital stay at the Internal Medicine Units of the Salamanca University Hospital Complex, from March 1, 2020 to June 1, 2020.

The care management program GACELA-Care® was used for data collection from NCR, extracting variables related to the characteristics of PIs, their carried-out treatment and the products used. GACELA-Care is a software that allows the registration of nursing actions in the care and monitoring of the hospitalized patient. This Health Information System uses the *"episode of care"* as the unit of record, defined as *"the process of care for an illness or demand made by the patient, which begins with the first contact with the health services and ends with the last contact related to the specific episode"*. Next, the CDR corresponding to the previously selected episodes were reviewed to complete the patient´s clinical, demographic and administrative information. In addition, the CDR allowed to fill in data not registered in Gacela Care®, especially for those patients who came from a previous stay in another hospital unit.

2.2. Eligibility criteria

According to National Pressure Ulcer Advisory Panel (NPUAP), we considered as PI any localized damage to the skin and underlying soft tissue, usually over a bony prominence or related to a medical or other device, result of intense and/or prolonged pressure or pressure in combination with shear [9].

2.2.1. Inclusion criteria. All adult patients (≥18 year old) admitted from March 1, 2020 to June 1, 2020 for more than 24 hours to Internal Medicine Units and diagnosed of PI in their medical or nursing records.

2.2.2. Exclusion criteria. Pediatric population and skin wounds registered as vascular, surgical, traumatic, neoplastic, Moisture-Associated skin damage (MASD) and other type of skin wounds, plus non-COVID-19 cases that were admitted to the hospital prior to March 1, 2020.

2.3. Data collection

The variables were classified into 2 groups: a) variables that allow characterizing the sample of patients, such as gender, age, hospitalization unit, principal diagnosis and secondary diagnosis/other diagnosis, reason for discharge, days of hospital stay, exitus letalis. b) variables related to the specific characteristics of PIs, such as number of PIs per patient, location, ulcer origin (domicile, unit or ICU acquired PI or Primary Health Care), date of appearance/registration

and closing date of the process, pain related to PI, stage according to the NPUAP staging system [stage I, Nonblanchable erythema of intact skin; stage II, partial-thickness skin loss involving the epidermis or dermis; stage III, full-thickness skin loss that may extend to, but not through, the fascia; stage IV, full-thickness skin loss involving deeper structures, such as muscle, bone or joint structures] [9], PI characteristics (size, shape, exudate type, edges, perilesional skin), infection and microorganism found in culture. Infection diagnoses are based on the indicators of suspected local infection enclosed on NPUAP/NPIAP/PPPIA quick guide [10], such as the increased exudates or change in its nature, pain or surrounding tissue temperature, larger size or depth, presence of pocketing/bridging, foul odor, friable granulation tissue, delayed healing and necrotic tissue. Samples for culture were taken by the nursing team or physicians from PI showing signs of infection by superficial swab or aspiration.

Data were collected and analyzed by two analysts. Patients were grouped according to the principal diagnosis: patients with a diagnosis of laboratory-confirmed SARS-CoV-2 infection (hereinafter referred to as "COVID-19 patients") and patients admitted for other causes (hereinafter referred to as "non-COVID-19 patients"). Skin injury episodes were stratified and analyzed into acute *versus* chronic pressure injuries.

2.4. Statistical analyses

We displayed the patients or PI characteristics using descriptive statistics: numbers (n), percentages (%), mean or median, and standard deviation (SD) or interquartile range (IQR = Q_3-Q_1). The Shapiro-Wilk test was used to verify normality. In the bivariate analysis, a Chi-square (χ^2) test was used to compare the association between demographics and clinical categorical variables of patients with and without COVID groups and the measured outcome was expressed as the odds ratio (OR) together with the 95% CI for OR. Continuous variables were compared with Student's t-test or Mann-Whitney test for two groups, depending on their normal or non-normal distribution. ANOVA allowed us to analyze the influence of independent nominal variables on a continuous dependent variable. In the second stage of the analysis, a post-hoc test (Fisher's Least Significant Difference (LSD), Bonferroni Test) was used after we found a statistically significant result and needed to determine where our differences truly came from. A p-value of $p<0.05$ was considered statistically significant. All statistical tests were performed using SPSS software (Statistical Package for the Social Sciences) version 26.0.

2.5. Ethics statement

The database supporting the findings of this study is available from the corresponding author on reasonable request. The study was approved by the Ethics Committee of the University Hospital of Salamanca (Code: PI 2019 03 208) (see S1 File). All data were kept confidential and processed anonymously in accordance with the requirements of Law 3/2018 of 5 December on the Protection of Personal Data and guarantee of digital rights.

3. Results

3.1. Frequency of PIs in the Internal Medicine Units

From March 1 to June 1, 2020, a total of 4286 episodes were recorded at the Salamanca University Hospital. Of them, 2857 episodes were recorded in Internal Medicine Units. Finally, 171 PI episodes requiring nursing care were recorded in the Internal Medicine Units during the first-wave COVID-19 pandemic (see flow diagram, Fig 1); 228 PI episodes were recorded during the same time period in the year prior to the pandemic (from March 1, 2019 to June 1, 2019). These 171 PI episodes corresponded to 101 patients, 86 episodes corresponded to 51

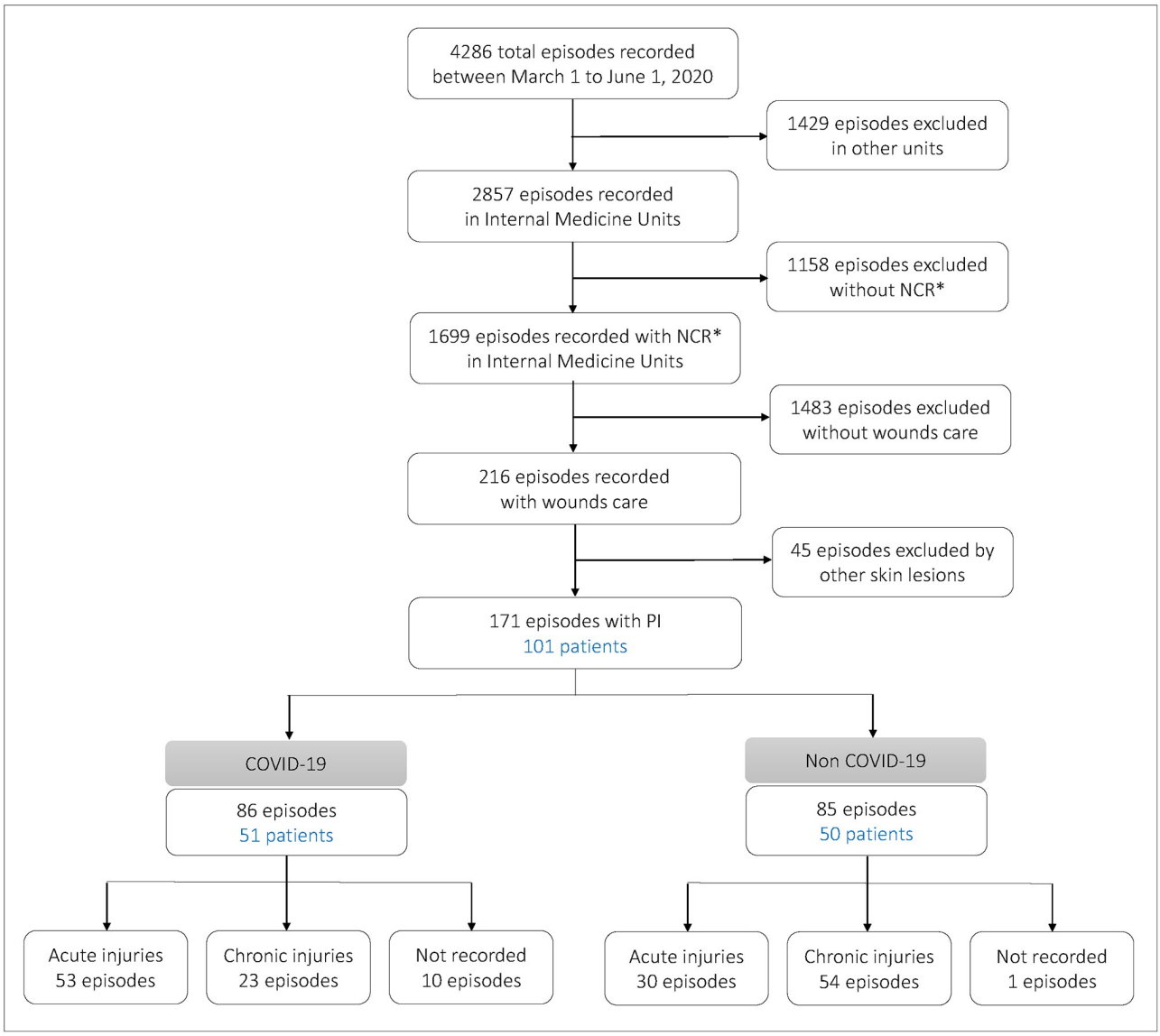

Fig 1. Flow diagram to show episodes recorded between March 1 and June 1, 2020. *NCR: Nursing Care Reports.

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COVID-19 patients and 85 episodes to 50 "non-COVID-19 patients". Only 2 patients required hospital readmission during the study period for SARS-CoV-2 transmission during their first hospital stay. The proportion of COVID-19 patients with PI in the Internal Medicine Units of Salamanca University Hospital during the first-wave COVID-19 pandemic was 4.3% (51/1196).

The *prevalence* of PI episodes in Internal Medicine Units of Salamanca University Hospital during the first-wave COVID-19 pandemic was 6% (171/2857). Of these, 77 episodes corresponded to injuries before their hospital admission, while 83 episodes were injuries that occurred during their hospital stay (11 episodes the site and time of appearance is unknown). Thus, the *cumulative incidence* of PI episodes in the Internal Medicine Units of Salamanca University Hospital during the first-wave COVID-19 pandemic was 2.9% (83/2857).

Table 1. Patient cohort characterization.

Variables	Total N = 101	COVID-19 (N_1 = 51)	Non-COVID-19 (N_2 = 50)	
Gender	**n (%)**	**n (%)**	**n (%)**	**p-value***
Male	45 (44.6)	24 (47.1)	21 (42.0)	0.609
Female	56 (55.4)	27 (52.9)	29 (58.0)	
Age, years				
<60 years	1 (1.0)	1 (2.0)	-	0.248
60–69 years	14 (13.9)	11 (21.6)	3 (6.0)	
70–79 years	17 (16.8)	8 (15.7)	9 (18.0)	
80–89 years	40 (39.6)	19 (37.3)	21 (42.0)	
90–99 years	27 (26.7)	11 (21.6)	16 (32.0)	
100 years	2 (2.0)	1 (2.0)	1 (2.0)	
Mean ± SD	82.9±10.8	81.1±12.3	84.8±8.7	0.080
No. episodes per patient				
1	60 (59.4)	28 (54.9)	32 (64.0)	0.162
2	22 (21.8)	15 (29.4)	7 (14.0)	
3 or more	19 (18.8)	8 (15.7)	11 (22.0)	
Mean ± SD	1.8±1.3	1.8±1.2	1.8±1.4	0.988
Principal diagnosis				
COVID-19 or SARS-CoV-2 infection	51 (50.5)	51 (100.0)	-	
Sepsis/septic shock/bacteremia	17 (16.8)	-	17 (34.0)	
Pneumonia/respiratory tract infection, . . .	12 (11.9)	-	12 (24.0)	
Urinary tract infection	7 (6.9)	-	7 (14.0)	
Neoplasm diagnosis	5 (5.0)	-	5 (10.0)	
Chronic renal disease	5 (5.0)	-	5 (10.0)	
Heart failure	3 (3.0)	-	3 (6.0)	
Digestive disease	1 (1.0)	-	1 (2.0)	
Stay in Intensive Care Unit	12 (11.9)	8 (15.7)	4 (8.0)	0.233
Case Fatality Rate	15 (14.9)	7 (13.7)	8 (16.0)	0.748
Hospital stay (days), mean ± SD	21.5±14.0	27.3±13.7	15.7±11.8	<0.001*

**p*-values with statistical significance level of 5% (p <0.05).

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3.2. Patient characteristics

Of the total 101 patients with PI episodes recorded in the Internal Medicine Units during the first-wave COVID-19 pandemic, 45 (44.6%) were men and 56 (55,4%) were women. The mean (±SD) age for the overall cohort was 82.9 years (±10.8) [median (IQR), 84 years (90–77)], range (48 a 100). Principal diagnosis was COVID-19 or SARS-CoV-2 infection in 51 patients; other principal diagnoses were sepsis/septic shock/bacteremia (17 patients) and pneumonia/respiratory tract infection (12 patients).

Table 1 summarizes the main characteristics of the sample. Percentage of females (58% vs. 52.9%; p = 0.609) and mean age were slightly higher in non-COVID-19 patients (84.8±8.7 vs. 81.1±12.3; p = 0.080), with no statistically significant differences between groups. The average hospital stay was significantly longer in the COVID-19 patient group (27.3±13.7 vs. 15.7±11.8; p<0.001). Twelve (11.9%) patients required a stay in an ICU, higher risk in the COVID-19 patient group (OR = 2.1; 95% CI, 0.6–7.6; p = 0.233); and 15 (14.9%) patients died, there were no significant differences between the two groups (0.748).

3.3. PI episodes characteristics

Of the total of 171 PI episodes recorded in the Internal Medicine Units during the first-wave COVID-19 pandemic, 83 episodes were injuries that occurred during the hospital stay (acute injuries), also known as Hospital Acquired Pressure Injuries (HAPI), and 77 episodes corresponded to injuries before the hospital admission (chronic injuries), 11 episodes the site and time of appearance is unknown. Risk of acute wounds was four times higher in COVID-19 patient group (OR = 4.1; 95% CI, 2.1–8.0; $p<0.001$) (see Fig 2).

Fig 3 shows the anatomic location of PIs in COVID-19 and non-COVID-19 patients. The most common locations were sacrum and heels with similar percentages.

Table 2 describes main PI characteristics (shape, exudate, edges, tunneling. . .) in two-episode groups.

3.3.1. Acute injuries. Of the 83 episodes, 53 occurred in patients with a COVID diagnosis and 30 in patients admitted for other diagnoses. In both subgroups, most PIs were classified between stage I and II (90.6% in COVID-19 vs 86.7% non-COVID-19). Only one patient with HAPI in the COVID-19 group required evaluation and follow-up from Plastic Surgery or Dermatology, compared to three patients in non-COVID-19 group. A percentage of the group of acute wounds (16.8%) used exclusively products aimed at prevention, such as Hyperoxygenated Fatty Acid (HOFA), protective dressing or heel pad. Only 21.6% required debridement: enzymatic (n = 14) and surgical (n = 4). Regarding other types of treatments, 27.8% needed moist environment dressing.

In the first stage of the analysis, the comorbidity showed statistically significant differences between acute injury episodes in patients with COVID-19 and non-COVID-19 ($p<0.001$). In the second stage of the analysis, we found statistically significant results between pairs of groups as Fig 4 illustrates. We noted a significant association in HAPIs between the presence of arterial hypertension (OR = 6.9; 95% CI, 1.9–25.6; p = 0.002) and diabetes mellitus

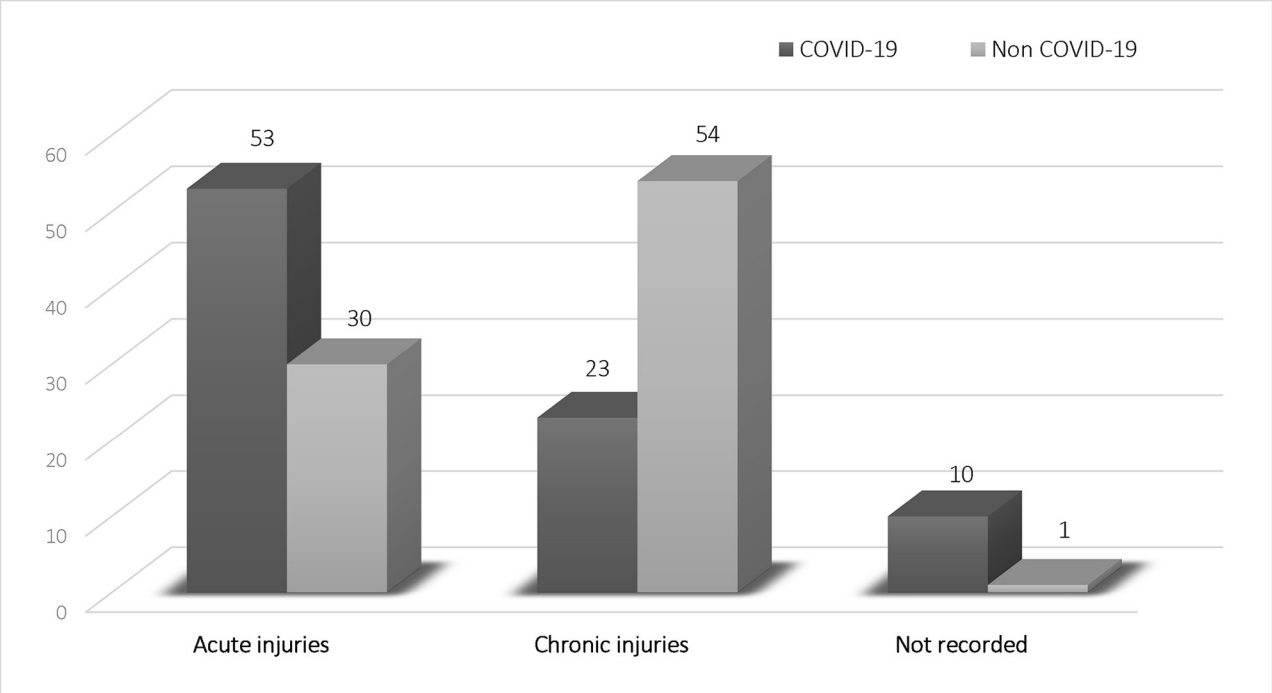

Fig 2. Acute vs. chronic PI episodes in COVID-19 and non-COVID-19 patients.

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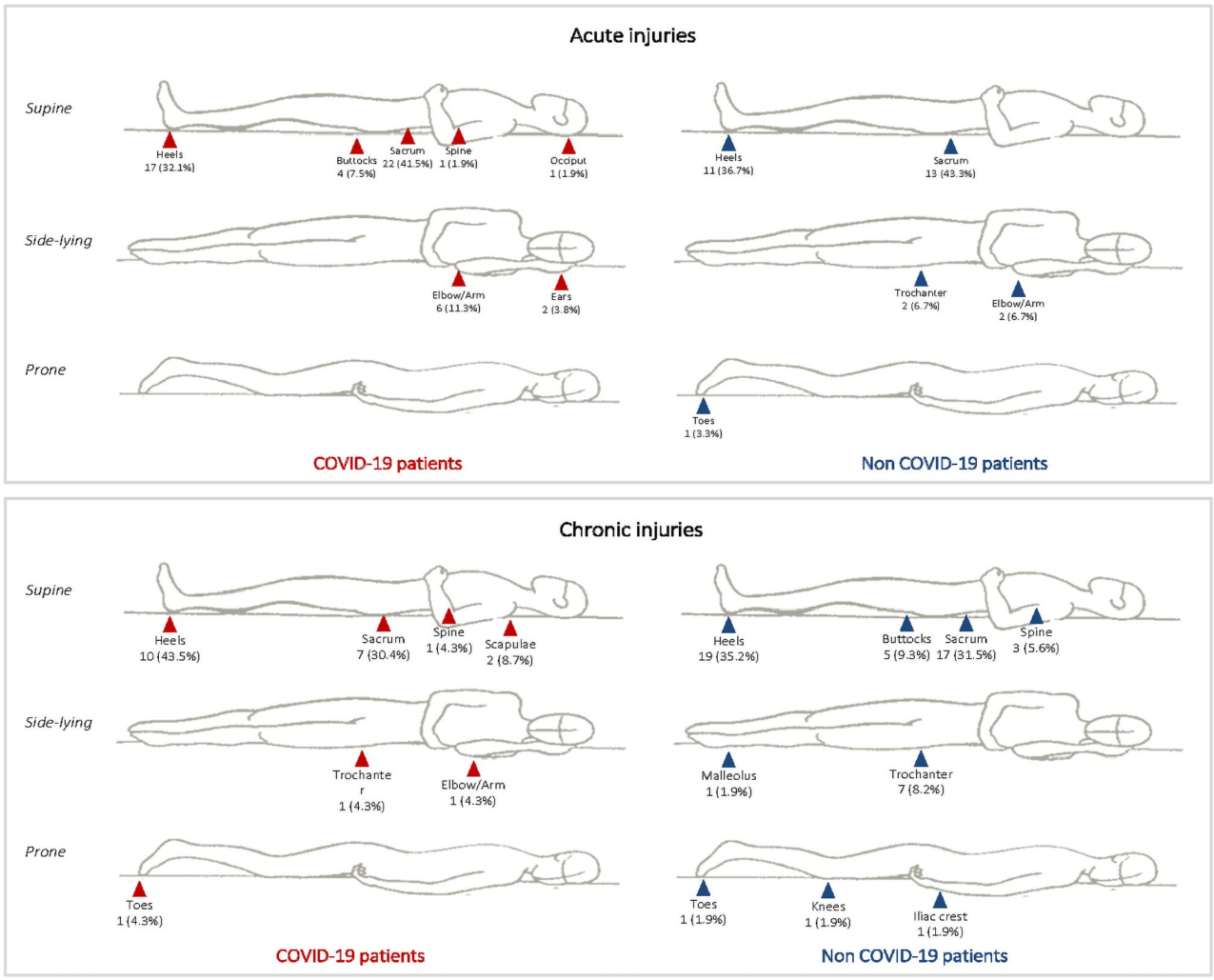

Fig 3. Anatomic location of acute vs. chronic PIs in COVID-19 and non-COVID-19 patients.

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(OR = 5.5; 95% CI, 1.2–26.1; p = 0.019) in patients with COVID-19 diagnosis. On the other hand, non-COVID-19 patients were more associated to other comorbidities as oncologic processes or neurodegenerative/cognitive impairment.

12% of the episodes of HAPIs (6 in COVID-19 group vs 4 non-COVID-19) were diagnosed with infection after displaying clinical signs, and culture was obtained in four of them, all belonging to COVID-19 group, with the following outcomes: *Candida Albicans* (1), *Pseudomonas Aeruginosa* (1), *Streptococcus Faecium* (1), *Pseudomonas Aeruginosa and Streptococcus Faecium* (1).

In COVID-19 patients, HAPIs infection was associated in a higher percentage with patients with malnutrition (50%) and kidney diseases (66.7%); in the group of patients without COVID-19 diagnosis, infected HAPI was associated in a higher proportion with the presence of cardiovascular, chronic pulmonary diseases and kidney comorbidity (75% in all cases): although these results were not statistically significant.

3.3.2. Chronic injuries. Of the 77 episodes, 23 occurred in patients with a COVID diagnosis and 54 in patients admitted for other diagnoses (only 1 episode the site and time of

Table 2. Acute vs. chronic injuries features in COVID-19 and non-COVID-19 patients.

Variables	Acute injuries (N_1 = 83)			Chronic injuries (N_1 = 77)		
	COVID-19 (N = 53)	Non-COVID-19 (N = 30)		COVID-19 (N = 23)	Non-COVID-19 (N = 54)	
Stage	n (%)	n (%)	p-value*	n (%)	n (%)	p-value*
I	18 (34.0)	12 (40.0)	0.198	4 (17.4)	10 (18.5)	0.033*
II	30 (56.6)	14 (46.7)		12 (52.2)	20 (37.0)	
III	2 (3.8)	4 (13.3)		7 (30.4)	9 (16.7)	
IV	3 (5.7)	-		-	15 (27.8)	
Shape						
Oval	10 (18.9)	10 (33.3)	0.624	8 (34.8)	14 (25.9)	0.079
Round/circular	8 (15.1)	4 (13.3)		1 (4.3)	7 (13.0)	
Irregular	4 (7.5)	4 (13.3)		1 (4.3)	14 (25.9)	
Not recorded	*31 (58.5)*	*12 (40.0)*		*13 (56.5)*	*19 (35.2)*	
Wound edges						
Delimited	9 (17.0)	8 (26.7)	0.542	6 (26.1)	11 (20.4)	0.480
Diffuse/Indistinguishable	1 (1.9)	1 (3.3)		1 (4.3)	6 (11.1)	
Damaged	4 (7.5)	1 (3.3)		3 (13.0)	4 (7.4)	
Not recorded	*39 (73.6)*	*20 (66.7)*		*13 (56.5)*	*33 (61.1)*	
Wound exudate						
None/dry wound	8 (15.1)	9 (30.0)	0.522	1 (4.3)	11 (20.4)	0.493
Sanguineous	2 (3.8)	-		-	2 (3.7)	
Serous	4 (7.5)	2 (6.7)		1 (4.3)	2 (3.7)	
Purulent	1 (1.9)	-		2 (8.7)	5 (9.3)	
Undetermined exudate	1 (1.9)	1 (3.3)		-	4 (7.4)	
Not recorded	*37 (69.8)*	*18 (60.0)*		*19 (82.6)*	*30 (55.6)*	
Perilesional skin						
Erythema	5 (9.4)	4 (13.3)	0.563	3 (13.0)	9 (16.7)	0.327
Maceration	-	-		1 (4.3)	4 (7.4)	
Desquamation	1 (1.9)	1 (3.3)		1 (4.3)	-	
Excoriation	-	-		-	2 (3.7)	
Edema	1 (1.9)	-		-	2 (3.7)	
Lacerated skin	-	1 (3.3)		-	-	
Not recorded	*46 (86.8)*	*24 (80.0)*		*18 (78.3)*	*37 (68.5)*	
Undermining/Cavitated PI	-	1 (3.3)	0.181	1 (4.3)	3 (5.5)	0.827
Pain	6 (11.3)	6 (20.0)	0.280	3 (13.0)	10 (18.5)	0.557
Infection	6 (11.3)	4 (13.3)	0.787	3 (13.0)	13 (24.1)	0.275
Management strategies						
Only preventive products	7 (13.2)	7 (23.3)	0.237	1 (4.3)	1 (1.9)	0.529
Moist environment treatment	16 (30.2)	7 (23.3)	0.503	8 (34.8)	24 (44.4)	0.431
Debridement	12 (22.6)	6 (20)	0.900	12 (52.2)	19 (35.2)	0.040*
Enzymatic Debridement	10	4		10	13	
Surgical debridement	2	2		2	6	
Plastic surgery	1 (1.9)	3 (10.0)	0.097	5 (21.7)	3 (5.6)	0.033*

*p-values with statistical significance level of 5% ($p < 0.05$).

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appearance is unknown). There are statistically significant differences in staging; with a distribution of 45.5% of PIs in stage III-IV in non-COVID-19 group versus 30.4% in stage III of the COVID-19 group (without any PI recorded in stage IV). As shown Fig 4, same as the group with acute injuries, there is a significant association in the chronic PIs between diabetes

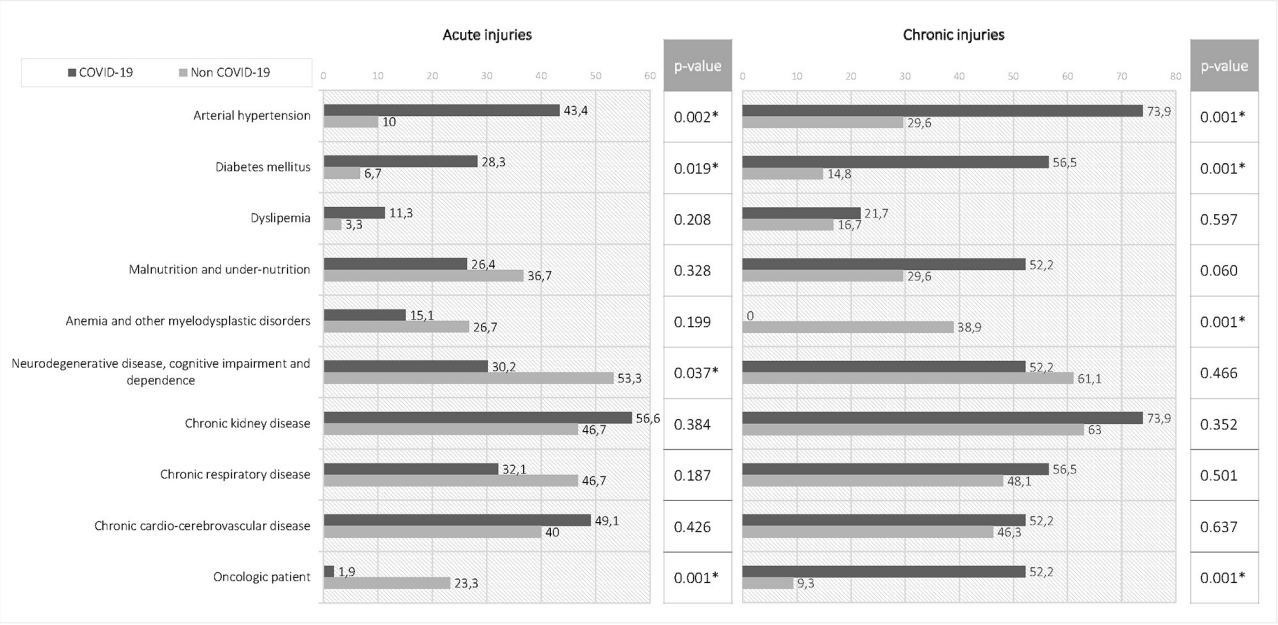

Fig 4. Percentage distribution comorbidity in acute injuries vs. chronic injuries and p-values obtained for the observed difference between the paired samples.

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mellitus (OR = 7.4; 95% CI, 2.4–23.8; p = 0.001) and arterial hypertension (OR = 6.7; 95% CI, 2.2–20.2; p = 0.001) in COVID-19 patients. Five patients in the COVID-19 group and three in non-COVID-19 group required the attention of Plastic Surgery or Dermatology service. Debridement was performed in 40.2% of PIs; surgical debridement was more frequent in non-COVID-19 group. 41.5% of registered HAPIs required a moist environment dressing.

Among chronic PIs, 20.7% of the skin lesions were infected (3 in COVID-19 group vs 13 non-COVID-19). The diagnosis of infection in the PIs was confirmed by microbiological analysis in nine episodes. The culture results in the COVID-19 group were *Escherichia Coli* (1), *Escherichia Coli* + *Morganella Morganii* (1) and *Pseudomonas Aeruginosa* + *Streptococcus Haemolyticus* + *Enterococcus Faecium* + *Candida Tropicalis* (1); and in the non-COVID-19 cultures were *Escherichia Coli* (1), *Morganella Morganii* (1), *Pseudomonas Aeruginosa* (1), *Proteus Mirabilis* + *Escherichia Coli* (1), *Proteus Mirabilis* + *Escherichia Coli* + *Pseudomonas Aeruginosa* (1) and *Serratia* (1).

In COVID-19 patients, infection of chronic PI was associated with cardiovascular pathology, kidney disease, arterial hypertension, anemia or other myelodysplastic disorders (100% in all cases) and diabetes mellitus (66.7%); in contrast, in the group of patients without COVID-19 diagnosis, infections were associated with the presence of kidney disease (69.2%), dementia and other neurological disorders with high degree of dependence (61.5%) and chronic pulmonary disease (61.5%); although these results were not statistically significant ($p>0.05$).

It should be noted that seven patients with chronic wounds and negative COVID-19 diagnosis were admitted due to complications associated with PI infection: three patients were admitted with the principal diagnosis of "cutaneous sepsis" or "soft tissue infection related to PI", one patient required readmission due to complications from a previous principal diagnosis of "urinary and respiratory sepsis and soft tissue infections" and was admitted with a secondary diagnosis of colonized sacral PI, one was admitted with main diagnosis "sacral PI

infection by *Morganella Morganii"* and finally, another patient was diagnosed with pararectal abscess in sacral PI.

4. Discussion

As the literature shows Hospital Acquired Pressure Injury (HAPI) is a well-known indicator of the quality of care in acute settings. A recent systematic review estimates that the average prevalence of PI among published studies in Europe is 10.8% with values ranging from 4.6% to 27.2% [11]. The 5th prevalence study carried out in Spain [12] estimated a prevalence of 7% with higher prevalence in services such as palliative care, intensive care and post-surgical and reanimation units. The study also indicates that 72.2% of PIs are of nosocomial origin, occurring in hospitals or nursing homes. The prevalence of PIs in this study (6%) is lower compared to previous studies, although the clinical context must be taken into account; the mean age of the sample was high and presented multiple combined pathologies. In both groups, the main comorbidities were associated with chronic illness, typical of the high mean age of our sample, such as diabetes mellitus, arterial hypertension, neurodegenerative diseases, kidney diseases, cerebrovascular diseases or respiratory diseases. All this leads to a clinical situation that may predispose to the development of PIs [13–15]. However, the two factors with the greatest association with the development of a HAPI in COVID-19 patients were diabetes mellitus and arterial hypertension. This association may be due to the established relationship between increased rates of hospital admission, severity and mortality of COVID-19 in patients with these comorbidities [16–20].

Statistical differences were observed with longer hospital stays in COVID-19 group. This may be explained by two possible reasons: first, the relationship of moderate or severe course of COVID-19 with longer hospital stays; second, by the effort to provide hospital beds for expected COVID-19, discharging non-COVID-19 patients. Our outcomes show statistically significant differences in terms of appearance time. In the COVID-19 group, HAPIs were more frequent than in the non-COVID-19 group, where more than half of patients had developed a PI prior to hospitalization.

Our study found no significant differences in terms of location of PIs acquired during the hospital stay, the heel area and sacral region were the most frequent with very similar percentages between the COVID-19 and non-COVID-19 group. However, the COVID-19 group recorded two acute PIs in the ear and one in the occiput compared to none in the non-COVID-19 group. The presence of HAPIs at these anatomic locations may be due to the fact that the respiratory status of hospitalized COVID-19 patients, especially critically ill, often interferes with standard preventive measures of repositioning patients. Prone positioning may be effective in improving respiratory status although some articles associate this position with an increased risk of facial HAPIs [21–24].

Despite COVID-19 patients presenting factors such as respiratory isolation, prohibition of family accompaniment, lack of personal protective equipment for the health workforces for safe access to patient care, etc., which may have altered the implementation of the protocolized preventive measures, fewer PIs were observed compared to the same period of the previous year. This may sound contradictory after taking into account the serious clinical status of the patients, the high mean age of the sample and the presence of multiple chronic conditions. Authors consider that given the situation of care overload, the high number of hospital admission and quick restructuring of nursing staff in a short period caused an underreporting of PIs, both hospital origin and pre-existing before admission, due to the prioritization of health care over the registry. This is also reflected in the lack of registration of the specific characteristics of each PI such as depth, size, exudate, etc.–only variables such as staging and location were

completed in all episodes–although their assessment, management and decision making of their treatment was likely carried out in situ during the assistance practice.

4.1. Strength and limitations

Retrospective data collection together with the worst period of hospital overload may have led to an underestimation of the prevalence or incidence rates because a proportion of PIs were not documented or lacked care information. Regarding the diagnosis of infection, the latest recommendations consider deep tissue biopsy cultures as the reference standard for the microbiological analysis of PIs, however, in routine clinical practice of our department, the aspiration or superficial swab culture are still used more frequently because they are simpler, cheaper and less invasive methods.

Despite these limitations, this study provides the first analysis of the situation of PIs care during the worst moment of the pandemic in Spain. Therefore, the main strength is focused on its originality and novelty due to the lack of knowledge about the burden of the novel COVID-19 disease in the care process. This study may provide the basis for future research and comparisons related to the impact of COVID-19 on hospital care, as well as, helping to improve the protocols for the prevention, registration and treatment of PIs in future pandemic situations.

5. Conclusions

The study shows that HAPIs were more frequent in COVID-19 group during the first wave of COVID-19. Diabetes mellitus and arterial hypertension were identified as main associated comorbidities in patients with COVID-19 diagnosis. Evidence reported in this study once again supports the importance of appropriate preventive measures to avoid this complication.

Supporting information

S1 File. Ethics committee approval.
(PDF)

S1 Data.
(SAV)

S2 Data.
(SAV)

Author Contributions

Conceptualization: Leticia Nieto-García, Montserrat Alonso-Sardón.

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Writing – review & editing: Leticia Nieto-García, Adela Carpio-Pérez, Montserrat Alonso-Sardón.

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Artículo Cuarto

Is the increase in record of skin wounds in hospitalized patients in Internal Medicine Units a side effect of the COVID-19 pandemic?

¿El incremento en el registro de heridas en pacientes hospitalizados en unidades de medicina interna es un efecto adverso de la pandemia por COVID-19?

Objetivo: Cuantificar el número de heridas crónicas registradas en el servicio de medicina interna del CAUSA antes y durante el primer año de la pandemia COVID-19.

Método: Se desarrolló un estudio longitudinal descriptivo retrospectivo para comparar los registros de heridas en pacientes hospitalizados en el servicio de medicina interna durante el primer año de la pandemia COVID-19 (del 1 de marzo de 2020 hasta 28 de febrero de 2021) y el año previo a la crisis sanitaria (del 1 enero al 31 de diciembre de 2019).

Resultados: Se registraron 1979 episodios de heridas crónicas en un total de 932 pacientes, 434 pacientes fueron ingresados durante el año 2019 y 498 durante el primer año de COVID-19. Dentro de este último grupo, 147 pacientes hospitalizados fueron diagnosticados de infección por SARS-CoV-2 (3.2%). El porcentaje de heridas registradas en el primer año de la pandemia fue superior al año anterior, 17.9% (1092/6090) versus 15% (887/5906), con un incremento estadísticamente significativo en los meses con más incidencia de casos COVID-19 ($p<0.001$).

Conclusiones: El incremento en la carga de cuidados de heridas crónicas durante la pandemia por la infección SARS-CoV-2 en comparación al año previo puede ser atribuible al incremento del número de pacientes hospitalizados por COVID-19 en las unidades de medicina interna.

European Journal of Internal Medicine

Is the increase in record of skin wounds in hospitalized patients in Internal Medicine Units a side effect of the COVID-19 pandemic?

--Manuscript Draft--

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Article Type:	Original Article
Keywords:	Skin wounds; wound care; Chronic wounds; COVID-19; Internal Medical Unit.
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Abstract:	Background/Objective Skin wound care is present in all areas of the healthcare system whether in hospitals, clinics, long term care institutions or in the community. The aim of this study was to quantify the number of skin wounds reported at the Internal Medicine Units in the University Hospital of Salamanca after and during the COVID-19 pandemic. Methods This descriptive longitudinal retrospective study is based on a comparison of skin wound records in patients hospitalized in the internal medicine service during the first year of the COVID-19 pandemic (from March 1, 2020, to February 28, 2021) and previous year to the outbreak (from January 1, 2019, to December 31, 2019). Results A total of 1,979 skin wound episodes were reported corresponding to 932 patients, 434 in the pre-pandemic year and 498 the first year of the COVID-19 pandemic. 147 inpatients were diagnosed with SARS-CoV-2 infection (3.2%). The percentage of wound episodes in the first year of the COVID-19 pandemic was higher than the pre-pandemic year, 17.9% (1,092/6,090) versus 15% (887/5,906), with a significant increase in the months with the highest incidence of COVID cases ($p<0.001$). Conclusion This study shows an increase in the burden of wound care during the COVID-19 pandemic compared to the previous year and it is directly attributable to the increase in the number of patients hospitalized for SARS-CoV-2 infection in Internal Medicine Units.
Suggested Reviewers:	Peter Nydahl peter.nydahl@uksh.de

Salamanca, June 14, 2022

Dear Editorial Board of **European Journal of Internal Medicine:**

I am pleased to send files of the manuscript: *"Is the increase in record of skin wounds in hospitalized patients in Internal Medicine Unit a side effect of the COVID-19 pandemic?"* to consider its publication in the section: **Original Article**.

The new coronavirus pandemic has had a significant impact on healthcare all over the world at all levels of care. In this work we gathered data from a subset of patients from Spain, one of the most affected countries, to quantify the records of wound care episodes and identify changes in the clinical-epidemiologic profile of inpatients in internal medicine units during the first year of COVID-19 pandemic compared to the previous year at the beginning of the outbreak. To our knowledge, this study provides the first analysis of the situation of wound care burden during the first year of the pandemic in Spain. It settles the basis for future research and comparisons related to the impact of COVID-19 on hospital care, as well as, helping to improve the protocols for the prevention, registration and treatment of chronic wound in future pandemic situations.

All authors have contributed throughout the process of development and drafting the manuscript, acknowledged Ethical Responsibilities, qualify for authorship and have approved the final version. In their name, I declare that the work is original and has not been previously published or is under review by another journal, and express that there is no conflict of interest in drafting the manuscript.

Waiting for your news,

Signed: Dra. Montserrat Alonso-Sardón

Original Article

Title

Is the increase in record of skin wounds in hospitalized patients in Internal Medicine Units a side effect of the COVID-19 pandemic?

Author names and affiliations

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Author contributions

LNG and MAS conceived and designed the study. ACP, TMB, FJRG and EMR collected the data. MAS and LNG analyzed the data. MAS and LNG drafted the manuscript. LNG, ACP, TMB, ANG and MAS contributed to the interpretation of the results and critical revision of the manuscript. All authors have read and approved the final version of the manuscripts.

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Declaration of competing interest

The authors have no ethical conflicts to declare.

Ethics approval

This study was reviewed and approved by the *Clinical Research Ethics Committee for Clinical Investigation of the University Hospital of Salamanca.* (Code: CEIm PI 2019 03 208).

Highlights

- The impact of COVID-19 on wound care is unknown.
- The present study confirms the increase in the records of wounds during the first three waves of COVID-19 compared to the previous pre-pandemic year.
- This descriptive research settles the basis for future studies evaluating the collateral effects and factors associated with pandemic in wound care field.

Abstract

Background/Objective

Skin wound care is present in all areas of the healthcare system whether in hospitals, clinics, long term care institutions or in the community. The aim of this study was to quantify the number of skin wounds reported at the Internal Medicine Units in the University Hospital of Salamanca after and during the COVID-19 pandemic.

Methods

This descriptive longitudinal retrospective study is based on a comparison of skin wound records in patients hospitalized in the internal medicine service during the first year of the COVID-19 pandemic (from March 1, 2020, to February 28, 2021) and previous year to the outbreak (from January 1, 2019, to December 31, 2019).

Results

A total of 1,979 skin wound episodes were reported corresponding to 932 patients, 434 in the pre-pandemic year and 498 the first year of the COVID-19 pandemic. 147 inpatients were diagnosed with SARS-CoV-2 infection (3.2%). The percentage of wound episodes in the first year of the COVID-19 pandemic was higher than the pre-pandemic year, 17.9% (1,092/6,090) *versus* 15% (887/5,906), with a significant increase in the months with the highest incidence of COVID cases ($p<0.001$).

Conclusion

This study shows an increase in the burden of wound care during the COVID-19 pandemic compared to the previous year and it is directly attributable to the increase in the number of patients hospitalized for SARS-CoV-2 infection in Internal Medicine Units.

Keywords

Skin wounds; Wound care; Chronic wounds; COVID-19; Internal Medical Unit.

Abbreviations

CDR - Clinical Discharge Report

COVID- 19 – Coronavirus disease

HA – Hospital admission

ICU - Intensive Care Unit

MASD - Moisture Associated skin damage

NCR - Nursing Care Report

PI – Pressure Injury

SARS-CoV-2 - Severe Acute Respiratory Syndrome Coronavirus 2

WHO - World Health Organization

Acknowledgements

Not applicable.

Introduction

The coronavirus disease (COVID-19) pandemic has severely challenged all health care systems around the world. Since the outbreak of the novel coronavirus (2019-nCoV) in December 2019 in Wuhan, China, confirmed cases have appeared in countries around the world with a serious impact in Spain, where the situational reports of World Health Organization (WHO) [1] revealed 1 854 951 confirmed cases of COVID-19 and 49 824 deaths as of December 2020 since the start of the pandemic in this country.

Literature reported that chronic wounds, especially pressure injuries (PI), are a main preventable problem in hospitalized patients associated with high morbidity, mortality, economic cost and loss of quality-of-life [2]. The first waves of COVID-19 may have had negative consequences for wound care due to the overburdened health care system, the urgent restructuring of health services and by limiting their services to essential activities during the lockdown, relegating wound care to the background. In addition, other factors that could influence routine care must be taken into account, such as the limitation of face-to-face consultations and the refusal of the patient to attend appointments for fear of exposure to COVID-19.

Although recent studies have begun to discuss the collateral damage of overburdened health care system and restricted access to non-essential health services during the COVID-19 pandemic [3], few studies have focused on how COVID-19 has affected the epidemiology and the pre-pandemic wound care model [4,5]. In this context, we deem it appropriate to support and promote research and exchange of best practices for skin wound care and prevention of wound complications. This includes collect information on the clinical and care burden of skin wounds on Healthcare Systems. For this reason, we strived to conduct a single institutional study of hospitalized patients who exhibited a skin wound episode during COVID-19 crisis in Internal Medicine Units in the Salamanca University Hospital Complex (Salamanca, Spain) to quantify skin wound care episode records and identify changes in the clinical-epidemiologic profile during the first year of COVID-19 pandemic compared to the previous year at the beginning of the outbreak.

Material and Methods

Study design

A descriptive longitudinal retrospective study was designed to examine the records and characteristics of skin wounds (staging, location, and types of wounds) in inpatients in Internal Medicine Units during the first year of the COVID-19 pandemic (from March 1, 2020, to February 28, 2021) and the year previous to the outbreak (from January 1, 2019, to December 31, 2019). In Spain, the first year included three waves (1st, 2nd and 3rd wave) of the COVID-19 pandemic. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Setting

This research was performed at the Salamanca University Hospital Complex *(Complejo Asistencial Universitario de Salamanca "CAUSA", in Spanish)*, Spain. It is a public and tertiary hospital with 903 acute beds, 110 medium-long stay beds and 45 hospital medical services. It provides healthcare cover to 331.048 inhabitants [Salamanca population January 1, 2020; INE: https://www.ine.es/].

Eligibility criteria

Inclusion criteria: All adult patients (≥18-year-old) admitted for more than 24 hours to Internal Medicine Units who presented a diagnosis of wounds in nursing records during the period March 1, 2020, to February 28, 2021, and from January 1, 2019, to December 31, 2019. The episodes include the following diagnosis: PI, vascular ulcer (arterial or venous ulcer), Moisture Associated skin damage (MASD), neuropathic diabetes foot or neoplastic lesions.

Exclusion criteria: Episodes of surgical or traumatic wounds, pediatric population and hospitalization in other non-Internal Medicine Units. Episodes recorded between January 1 and March 1, 2020 were also excluded since the reports from the National Health System were severely underreporting the number of COVID-19 cases due to the new illness and not enough and adequate testing, even though there was SARS-CoV-2 community transmission.

Data collection

Two researchers reviewed the Nursing Care Reports (NCR) records of admitted subjects who had one or more wound/s during their hospital stay at the Internal Medicine Units of the Salamanca University Hospital Complex, from January 1, 2019, to February 28, 2021. *Hospital admission* (HA) involves staying at a hospital for at least one night or more. The care management program GACELA-Care®, a software that allows the registration of nursing action in the care and monitoring of the hospitalized patient, was used for data collection from NCR. This Health Information System uses the *"episode of care"* as the unit of record, defined as *"the process of care for an illness or demand made by the patient, which begins with the first contact with the health services and ends with the last contact related to the specific episode"*. Data were collected by date of wound records in Gacela Care. Subsequently, stratified and analyzed in two groups: pre-COVID-19 episodes (from January 1, 2019, to December 31, 2019) *versus* first year COVID-19 episodes (from March 1, 2020, to February 28, 2021). In addition, these episodes in the first year of the COVID-19 pandemic were further subdivided and compared according to principal diagnosis: COVID-19 group *versus* non-COVID-19 group. Next, the Clinical Discharge Reports (CDR) corresponding to the previously selected episodes collected during the pandemic were reviewed to identify the patients with a positive diagnostic test to detect the presence of active infection by SARS-CoV-2 and complete variables as admission to Intensive Care Unit (ICU) and *exitus letalis*. According to Health Care authority, a total of 4,534 patients were hospitalized with a diagnosis or clinical suspicion of COVID at the University Hospital of Salamanca from March 1, 2020, to February 28, 2021 [JCYL open data portal. Epidemiological situation of the coronavirus (COVID-19) in Castilla y León: https://analisis.datosabiertos.jcyl.es/pages/coronavirus/?seccion=situacion-hospitales]

Statistical analyses

Descriptive statistics were used to describe the basic features of the data in this research: numbers (n), percentages (%), mean and standard deviation (SD). The Shapiro-Wilk test was used to verify normality. In the bivariate analysis, a Chi-square (χ^2) test was used to test differences between two categorical variables and the measured outcome was expressed as the odds ratio (OR) together with the 95% CI for OR. Continuous variables

were compared with Student's t-test or Mann-Whitney test for two groups, depending on their normal or non-normal distribution. ANOVA allowed us to examine the influence of two different categorical variables on one continuous variable. To test multivariate predictive models, we applied the Logistic Regression Model. A p-value of $p<0.05$ was considered statistically significant. All statistical tests were performed using SPSS software (Statistical Package for the Social Sciences) version 26.0.

Ethics Statement

The database supporting the findings of this study is available from the corresponding author on reasonable request. The study was approved by the Ethics Committee of the University Hospital of Salamanca (Code: PI 2019 03 208). All data were kept confidential and processed anonymously in accordance with the requirements of Law 3/2018 of 5 December on the Protection of Personal Data and guarantee of digital rights.

Results

Skin wound episode records

In the first year of the COVID-19 pandemic (from March 1, 2020, to February 28, 2021), 1,092 skin wound episodes were recorded in Internal Medicine Units at the Salamanca University Hospital. In the pre-pandemic year (from January 1, 2019, to December 31, 2019), 887 skin wound episodes were recorded in the same units. Of the 1,092 skin wound episodes (1st year COVID-19 pandemic), 293 episodes occurred in patients with a COVID-19 diagnosis and 799 in non-COVID-19 (see flow chart of episode records, **Fig. 1**). **Table 1** summarizes all the episode records collected and the measures of frequency calculated. The percentage of skin wound episodes in the first year of COVID-19 pandemic was higher than pre-pandemic year, 17.9% (1,092/6,090) *versus* 15% (887/5,906). **Fig. 2** shows graphically this temporal evolution (months) of skin wound episodes from January 1, 2019, to February 28, 2021. The percentage of skin wound episodes in hospitalized patients with a COVID-19 diagnosis in Internal Medicine Units was 4.8% (293/6,090). **Fig. 3** compares wound episodes recorded in patients with COVID-19 and non-COVID-19 diagnoses during the first year of the pandemic. We observed a significant increase in the

percentage of wound episodes in the months with the highest incidence of COVID cases (20.6% and 19.8%, second and third waves, respectively; p<0.001).

The 1,979 skin wound episodes analyzed correspond to 932 patients, 434 pre-pandemic year and 498 first year of COVID-19 pandemic; 147 inpatients were diagnosed with SARS-Cov-2 infection, representing 3.2% (147/4,534) of the patients hospitalized with a diagnosis or clinical suspicion of COVID at the University Hospital of Salamanca during the first year of COVID-19 pandemic.

Clinical and epidemiologic characteristics of skin wounds

1st year COVID-19 pandemic *versus* pre-pandemic: Table 2 shows main characteristics of skin wounds before and during the pandemic. No statistically significant differences were observed in the demographic profile of patients with skin wound episodes (gender, p=0.807; age, p=0.122) or in the type (p=0.216). Significant differences were observed in the stage (p=0.004) and location of the wounds (p=0.006).

COVID-19 *versus* non-COVID-19: Table 3 compares the clinical and epidemiological profile of skin wound episodes in patients with COVID-19 and non-COVID-19 diagnosis. The mean age of inpatients diagnosed with COVID is significantly lower (p<0.001). The probability of stage I-II skin wounds was twice as high among inpatients with a COVID-19 diagnosis [OR=1.9; 95% CI, 1.4-2.6; p<0.001]. The probability of ICU stay was six times higher among hospitalized patients with a COVID-19 diagnosis [OR=5.7; 95% CI, 3.3-9.8; p<0.001]. Case fatality rate was higher in patients with a COVID-19 diagnosis (27% versus 20.7%, p=0.027). Table 4 summarizes main features of the clinical-epidemiological profile of skin wounds in epidemic waves. In the second wave of the pandemic, the clinical profile of wound episodes differed due to the increased burden of patients with SARS-CoV-2 infection. Thus, the multivariable logistic regression model identified the following variables as predictors for patients with COVID-19 diagnosis: stage I-II [Exp(B)=2.2; 95% CI, 1.2-3.9; p=0.007], pressure wounds [Exp(B)=3.0; 95% CI, 1.1-8.2; p=0.028], ICU stay [Exp(B)=8.0; 95% CI, 3.1-21.0; p<0.001], and death/*exitus letalis* [Exp(B)=2.5; 95% CI, 1.5-4.1; p<0.001].

Discussion

The impact of the COVID-19 pandemic on wound prevention and management has been evaluated in very few studies to date [6-9]. A study conducted in Germany [6] shows that the COVID-19 pandemic may have had a negative consequence in terms of diagnostic work-up, hospitalization and access to a primary care physician. However, this study found no significant difference on ambulatory care or wound-specific quality of life. Another study [7] highlighted among its outcomes that 76% of health professionals consider that the pandemic affected the management of wound dressing and almost 23% of patients/caregivers believed they had a wound clinic as usual.

In Spain, the 5th prevalence study of PIs and other dependence-related skin lesions in adult patients, carried out in Spain [10], estimated a mean prevalence of 7% with higher rates in services such as palliative care, intensive care and post-surgical and reanimation units. Nevertheless, the incidence/prevalence rates are very irregular depending on the region. For example, a systematic review on the prevalence of PIs in Europe shows varying data from to 4.6% to 27.2%, with a mean of 10.8% [11]. During COVID-19 era, the combination of very high-risk patients and the changes in the structure of routine preventive care may have led to an increase in the development of chronic wounds, mainly PIs. In addition, the high demand of intensive care in patients with severe course of COVID-19 increases the risk factors and worsens the healing of chronic wounds. The outcome of our study establishes that wound numbers have fluctuated from a steady increase from June to August 2020, hitting the highest peak in the month of August. However, the trend in the number of total all stage wounds began to decline in September. A decrease in the records is observed during the months of March, April and May 2020, which correspond to the first great wave of COVID-19, when compared to the records of the previous year in the same months. This may be due to the fact that during the first wave, the health care system was overloaded due to a very high rate admission of patients in short periods of time, most of which required intensive care; this led to the creation of improvised ICUs sometimes staffed by professionals not so experienced in this type of wards. These factors, along with the shortage of health professionals under quarantine compared to the needs of the system, mustered a desperate health situation

that favored under- registration. Furthermore, it must be added that the need of beds for COVID-19 patients, the suspension of scheduled interventions and the restructuring of scheduled consultations during the first wave also reduced the number of admissions for other chronic pathologies, often associated with predisposing factors for the PI development. When comparing wound records in the first wave with second and third waves, an increase is observed in those months with maximum peaks of hospitalization for COVID-19.

By etiology, PIs presented the highest prevalence, followed by vascular. Regarding the PI severity, the most frequent stage of the NPUAP was stage II in both periods. The skin injuries recorded in stage I are significantly higher in the pandemic year. Same result is found in patients with COVID-19 when comparing staging to the non-COVID-19 group. This increase may be an indicator for the monitoring, follow-up and registration protocol was active; but the high flow of hospitalization, the isolation situation, the lack of family support and the clinical course of the disease itself magnify the risk.

Evidence indicates that wound care generally, and chronic wound management and treatment in particular, becomes more important as the population ages, because the prevalence of chronic wounds is highly correlated with age. As some studies indicate, the profile of the elderly patient may also be a negative factor in wound healing [12]. It is also added that patients with chronic wounds have a higher risk of suffering a serious course after SARS-CoV-2 infection due to their older age and multiple comorbidities. However, age was not identified as a statistically significant risk marker in our model. The possible cause is that this study is framed in a geographical area with a very aged population and high life expectancy.

As the literature shown [13,14], health professionals have battled with different support zones than usual by increasing the use of the prone position (PP) in patient with COVID-19 with the aim of improving the prognosis in patients with respiratory distress [15]. The main affected area, consistent with previous findings [10], was sacrum and heels. Significant differences are observed between patients with COVID-19 vs non-COVID-19 when analyzing both groups. Regions especially vulnerable to the prone position such as

the face and ears are recorded in patients with COVID-19 compared to non-COVID-19 group.

Bearing in mind the significant impact of wounds on patient health and on costs, ensuring wounds are appropriately diagnosed and treated is essential. This can be achieved by improving the skills of health care providers. There is a need to foster education and training of healthcare workers on the importance of wound care as essential for a good quality health system. This means a more holistic approach to wound care as an example of best practice, not just narrow treatments.

Limitations and Strengths

Data collection was the main methodological limitation of this research, due to: i) it is a retrospective descriptive study, with the limitations inherent to this type of design; ii) deficient or non-completion of data on the care process in hospital records as a consequence of the impact and care burden caused by the COVID-19 pandemic in the Health Services. In addition, the limited number of publications related to our work objective did not allow us to compare and discuss our results with previous similar studies; we can only present our observations.

However, this limitation also becomes a strength, because to our knowledge, this study provides the first analysis of the situation of wound care burden during the worst moment of the pandemic in Spain. It provides the basis for future research and comparisons related to the impact of COVID-19 on hospital care, as well as, helping to improve the protocols for the prevention, registration, and treatment of chronic wound in future pandemic situations.

Conclusions

COVID-19 has marked a before and after in health systems around the world. This study shows an increase in the burden of wound care during the covid year compared to the previous one, mainly from PIs, probably due to multiple factors as elderly patient, lack of nursing professionals in quarantine or overloaded system.

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Table 1. Episode registry in the C.A.U.S.A. Internal Medicine Units.

Pre-pandemic year (From January 1, 2019, to December 31, 2019)				First year of the COVID-19 pandemic (From March 1, 2020, to February 28, 2021)								COVID-19 waves			
	TOTAL				TOTAL			No-COVID-19		COVID-19			TOTAL		
Months	Episodes	Wounds	%	Months	Episodes	Wounds	%	Wounds	%	Wounds	%	Waves	Episodes	Wounds	%
Jan-2019	672	84	12.5	Mar-2020	931	76	8.2	64	6.9	12	1.3				
Feb-2019	556	30	5.4	Apr-2020	671	68	10.1	17	2.5	51	7.6	1st wave	2316	325	14.0
Mar-2019	514	91	17.7	May-2020	367	96	26.1	58	15.8	38	10.3				
Apr-2019	480	80	16.6	Jun-2020	347	85	24.5	82	23.6	3	0.9				
May-2019	474	95	20.0	Jul-2020	420	113	26.9	108	25.7	5	1.2				
Jun-2019	451	79	17.5	Aug-2020	393	124	31.5	120	30.5	4	1.0				
Jul-2019	483	64	13.2	Sep-2020	439	71	16.2	58	13.2	13	3.0	2nd wave	2388	492	20.6
Aug-2019	443	67	15.1	Oct-2020	576	98	17.0	55	9.5	43	7.5				
Sep-2019	394	75	19.0	Nov-2020	560	86	15.4	53	9.5	33	5.9				
Oct-2019	487	99	20.3	Dec-2020	352	110	31.2	75	21.3	35	9.9				
Nov-2019	477	82	17.2	Jan-2021	558	73	13.1	51	9.1	22	4.0	3rd wave	1386	275	19.8
Dec-2019	475	41	8.6	Feb-2021	476	92	19.3	58	12.2	34	7.1				
TOTAL	**5906**	**887**	**15.0**	**TOTAL**	**6090**	**1092**	**17.9**	**799**	**13.1**	**293**	**4.8**	**TOTAL**	**6090**	**1092**	**17.9**

Table 2. Main clinical and epidemiological characteristics of skin wounds: Pre-pandemic year *versus* First year of the COVID-19 pandemic.

			pre-pandemic	1st year COVID pandemic	p-value
Patients			**N_1=434**	**N_2=498**	***p < 0.05**
Gender, n (%)	Male		217 (50.0)	245 (49.2)	0.807
	Female		217 (50.0)	253 (50.8)	
Age (years), mean ± SD			84.3 ± 10.2	83.2 ± 10.6	0.122
No. episodes per patient, mean ± SD			1.7 ± 1.2	2.0 ± 1.4	0.010*
Episodes			**N_1=887** **n (%)**	**N_2=1,092** **n (%)**	
Stages	I		177 (20.0)	275 (25.3)	0.004*
	II		403 (45.6)	478 (43.9)	
	III		206 (23.3)	198 (18.2)	
	IV		98 (11.1)	137 (12.6)	
Types	PI		742 (83.7)	950 (87.0)	0.216
	Venous ulcers		62 (7.0)	65 (6.0)	
	Arterial ulcers		13 (1.5)	16 (1.5)	
	MASD		33 (3.7)	29 (2.7)	
	Neoplastic lesions		12 (1.4)	6 (0.5)	
	Neuropathic (diabetic)		25 (2.8)	26 (2.4)	
Anatomical positions and locations	*Supine*		*575 (64.8)*	*788 (72.2)*	0.462
		Occiput	1 (0.1)	2 (0.2)	
		Scapulae	5 (0.6)	8 (0.7)	
		Elbows	3 (0.3)	14 (1.3)	
		Spine	16 (1.8)	28 (2.6)	
		Buttocks	42 (4.7)	49 (4.5)	
		Sacrum/coccyx	279 (31.5)	373 (34.2)	
		Heels	229 (25.8)	314 (28.8)	
	Side-lying		*209 (23.6)*	*208 (19.0)*	0.009
		Acromioclavicular	8 (0.9)	5 (0.5)	
		Arms/hands	3 (0.3)	16 (1.5)	
		Iliac crest	4 (0.5)	5 (0.5)	
		Trochanter	68 (7.7)	63 (5.8)	
		Leg	78 (8.8)	90 (8.2)	
		Malleolus	48 (5.4)	29 (2.7)	
	Prone		*85 (9.6)*	*82 (7.5)*	0.846
		Nose	4 (0.5)	2 (0.2)	
		Ears	8 (0.9)	5 (0.5)	
		Sternum	-	1 (0.1)	
		Breasts	1 (0.1)	1 (0.1)	
		Genitalia	6 (0.7)	5 (0.5)	
		Knees/tibial crest	5 (06)	7 (0.6)	
		Toes	61 (6.9)	61 (5.6)	
	Others		18 (2.0)	14 (1.3)	

Table 3. Main clinical and epidemiological characteristics of skin wounds during first year of the COVID-19 pandemic: COVID-19 *versus* non-COVID-19.

			COVID-19	Non-COVID-19	p-value
Patients			**N_1=147**	**N_2=351**	***p < 0.05**
Gender, n (%)	Male		76 (51.7)	169 (48.1)	0.469
	Female		71 (48.3)	182 (51.9)	
Age (years), mean ± SD			80.5 ± 12.3	84.4 ± 9.6	0.000*
No. episodes per patient, mean ± SD			1.9 ± 1.3	2.0 ± 1.4	0.706
Episodes			**N_1=293** **n (%)**	**N_2=799** **n (%)**	
Stages	I		90 (30.8)	185 (23.2)	0.000*
	II		140 (47.9)	338 (42.5)	
	III		41 (14.0)	157 (19.7)	
	IV		21 (7.2)	116 (14.6)	
Types	PI		264 (90.1)	686 (85.9)	0.065
	Venous ulcers		11 (3.8)	54 (6.8)	
	Arterial ulcers		2 (0.7)	14 (1.8)	
	MASD		11 (3.8)	18 (2.3)	
	Neoplastic lesions		4 (1.4)	2 (0.3)	
	Neuropathic (diabetic)		1 (0.3)	25 (3.1)	
Anatomical positions and locations	*Supine*		*234 (79.9)*	*554 (69.3)*	0.020*
		Occiput	2 (0.7)	-	
		Scapulae	4 (1.4)	4 (0.5)	
		Elbows	7 (2.4)	7 (0.9)	
		Spine	3 (1.0)	25 (3.1)	
		Buttocks	14 (4.8)	35 (4.4)	
		Sacrum/coccyx	117 (39.9)	256 (32.0)	
		Heels	87 (29.7)	227 (28.4)	
	Side-lying		*32 (10.9)*	*176 (22.0)*	0.012*
		Acromioclavicular	2 (0.7)	3 (0.4)	
		Arms/hands	6 (2.0)	10 (1.3)	
		Iliac crest	-	5 (0.6)	
		Trochanter	9 (3.1)	54 (6.8)	
		Leg	15 (5.1)	75 (9.4)	
		Malleolus	-	29 (3.6)	
	Prone		*19 (6.5)*	*63 (7.9)*	0.000*
		Nose	2 (0.7)	-	
		Ears	5 (1.7)	-	
		Sternum	1 (0.3)	-	
		Breasts	-	1 (0.1)	
		Genitalia	-	5 (0.6)	
		Knees/tibial crest	1 (0.3)	6 (0.8)	
		Toes	10 (3.4)	51 (6.4)	
	Others		8 (2.7)	6 (0.8)	
ICU			41 (14.0)	22 (2.8)	0.000*
Exitus letalis			79 (27.0)	165 (20.7)	0.027*

Table 4. Main features of the clinical-epidemiological profile of skin wounds in epidemic waves.

		1st wave (Patients=165; Episodes=325)			2nd wave (Patients=228; Episodes=492)			3rd wave (Patients=105; Episodes=275)			p-value
		COVID	Non-COVID	p-value OR (95% CI)	COVID	Non-COVID	p-value OR (95% CI)	COVID	Non-COVID	p-value OR (95% CI)	
		N_1=61	N_1=104		N_1=51	N_1=177		N_1=35	N_1=70		
Gender, n (%)	Male	29 (47.5)	45 (43.3)	0.594	25 (49.0)	82 (46.3)	0.734	22 (62.9)	42 (60.0)	0.777	0.469
	female	32 (52.5)	59 (56.7)	1.1 (0.7-1.8)	26 (51.0)	95 (53.7)	1.4 (0.9-2.2)	13 (37.1)	28 (40.0)	1.6 (0.9-2.8)	
Age (years), mean±SD		80.0±13.0	83.0±9.7	0.282	80.2±11.9	85.0±10.1	0.251	81.9±11.8	84.8± 8.2	0.242	0.145
No. episodes per patient, mean±SD		1.7±1.0	1.9±1.4	0.189	1.7±0.9	1.9±1.2	0.352	2.7±2.0	2.2±1.8	0.262	0.003*
		N_1=104	N_1=221		N_1=98	N_1=394		N_1=91	N_1=184		
Stages	I-II	84 (80.8)	138 (63.0)	0.001*	80 (81.6)	265 (67.3)	0.005*	66 (73.3)	120 (65.6)	0.196	0.000*
	III-IV	20 (19.2)	81 (37.0)	2.5 (1.4-4.3)	18 (18.4)	129 (32.7)	2.2 (1.2-3.8)	24 (26.7)	63 (34.4)	1.4 (0.8-2.5)	
Types	PI	89 (85.6)	173 (78.3)	0.121	93 (94.9)	345 (87.6)	0.038*	82 (90.1)	168 (91.3)	0.746	0.065
	Others	15 (14.4)	48 (21.7)	1.6 (0.9-3.1)	5 (5.1)	49 (12.4)	2.6 (1.1-6.8)	9 (9.9)	16 (8.7)	0.9 (0.4-2.0)	
Anatomical positions	*Supine*	85 (81.7)	140 (63.3)		81 (82.7)	278 (70.6)		68 (74.7)	136 (73.9)		
	Side-lying	12 (11.5)	53 (11.8)	0.009*	8 (8.2)	86 (21.8)	0.009*	12 (13.2)	37 (20.1)	0.045*	0.000*
	Prone	7 (6.7)	26 (11.8)		7 (7.1)	28 (7.1)		5 (5.5)	9 (4.9)		
ICU		16 (15.4)	8 (3.6)	0.000* 4.8 (2.0-11.7)	11 (11.2)	9 (2.3)	0.000* 5.4 (2.2-13.4)	14 (15.4)	5 (2.7)	0.000* 6.5 (2.3-18.7)	0.000*
Exitus letalis		19 (18.3)	38 (17.2)	0.812 1.1 (0.6-2.0)	35 (35.7)	78 (19.8)	0.001* 2.2 (1.4-3.6)	25 (27.5)	49 (26.6)	0.882 1.1 (0.6-1.8)	0.027*

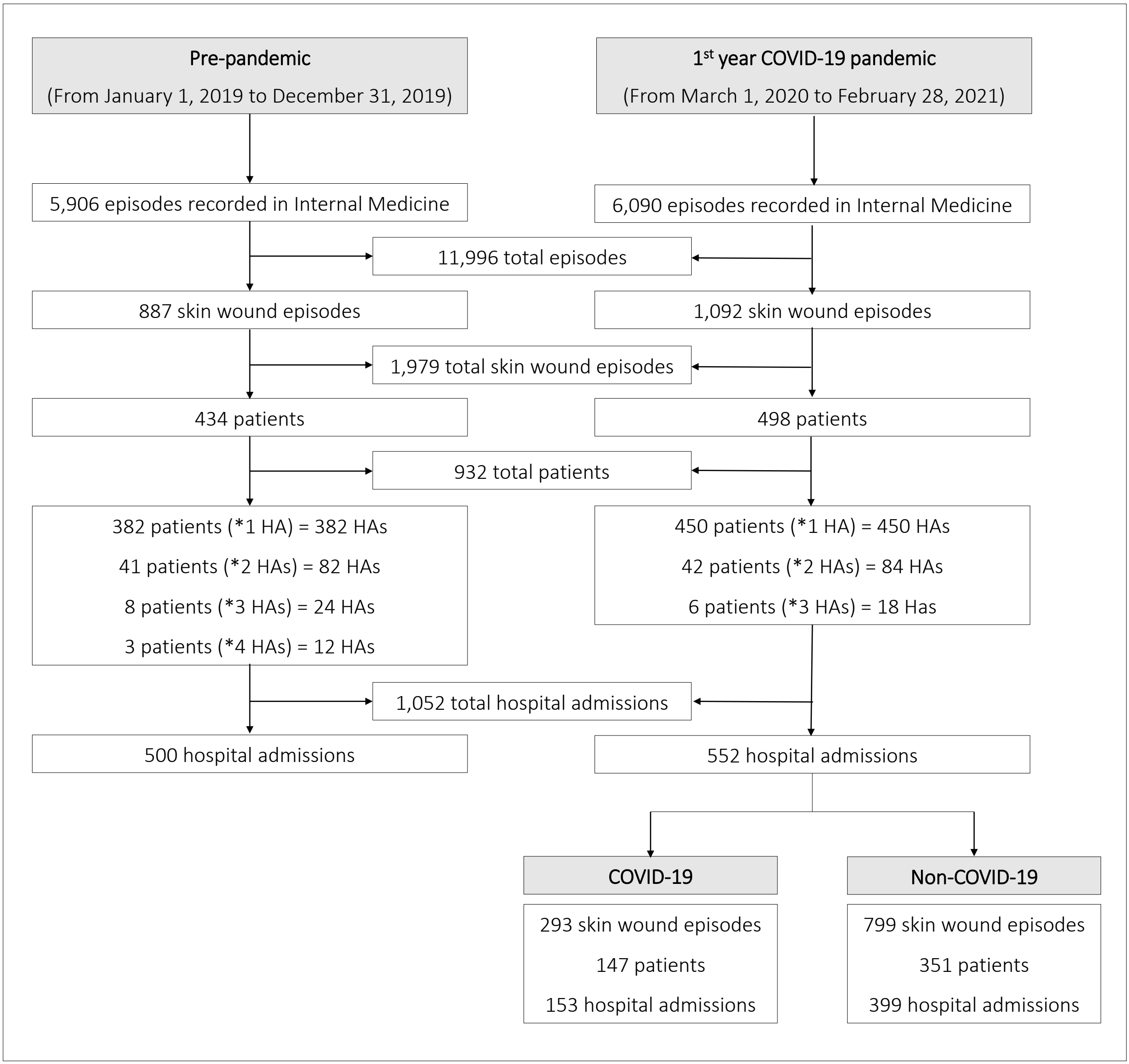

Fig. 1. Flow chart of episode records.

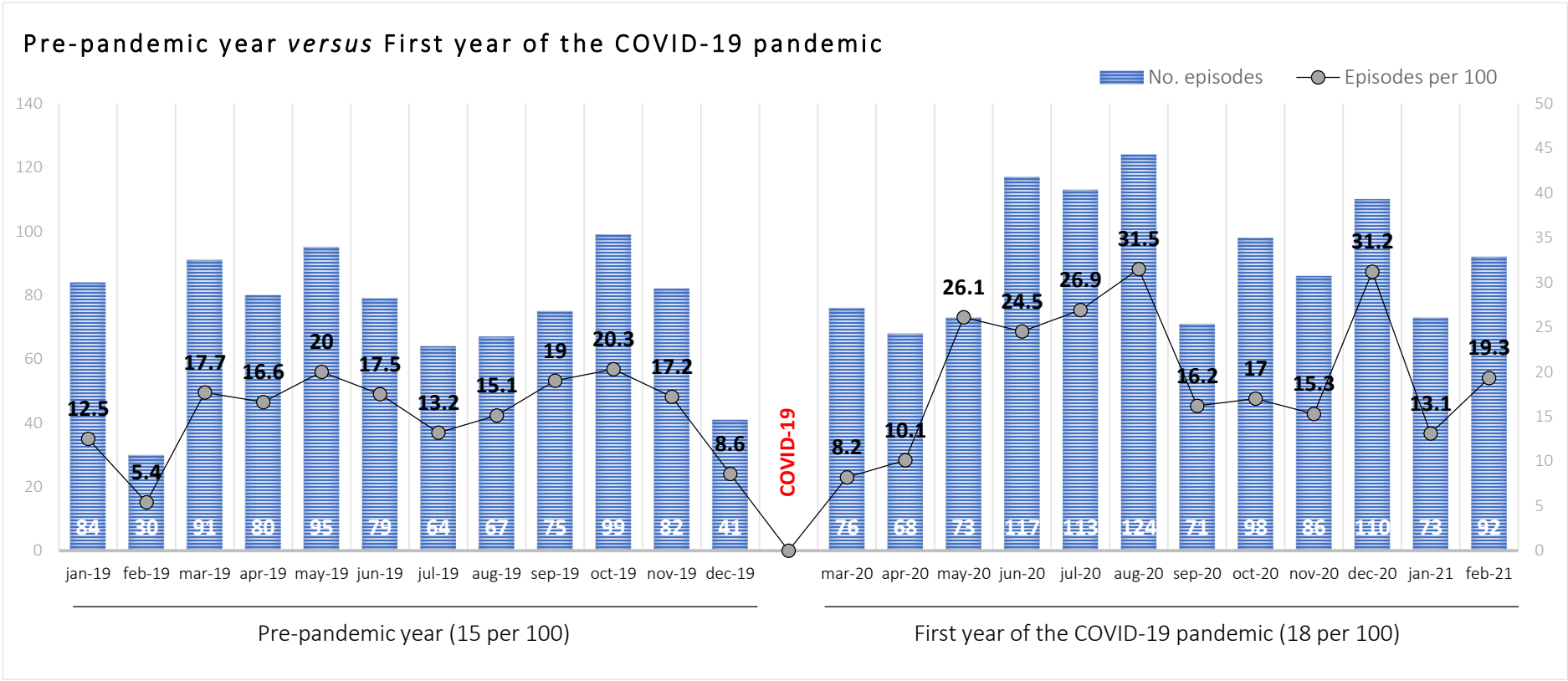

Fig. 2. Temporal evolution of skin wound episodes before (pre-pandemic year, 2019) *versus* during first year of the COVID-19 pandemic in Internal Medicine Units, Salamanca (Spain).

Fig_3

Click here to access/download;Figure(s);Fig_3.pptx

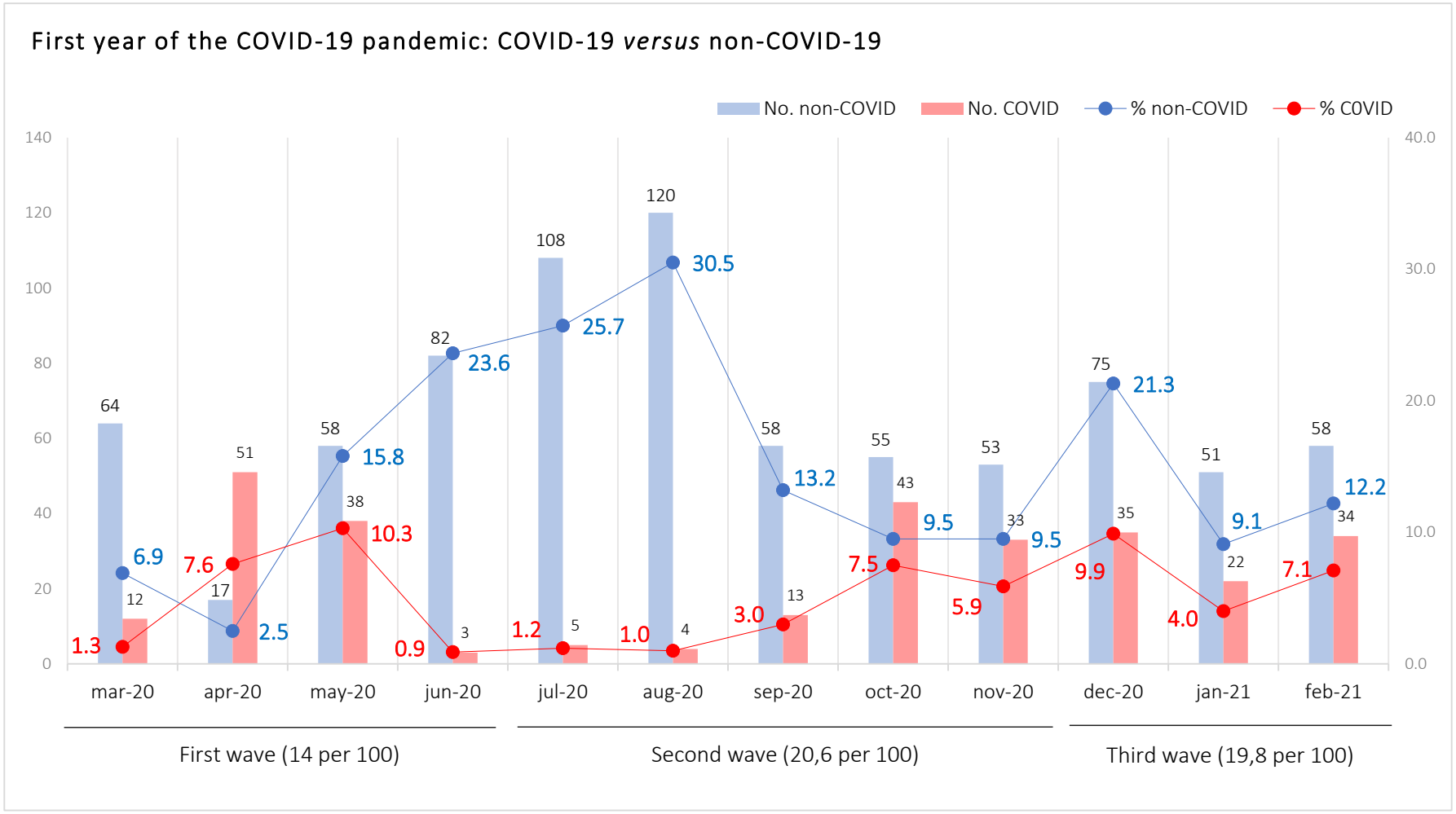

Fig. 3. Temporal distribution of skin wound episodes during first year of the COVID-19 pandemic in Internal Medicine Units: COVID-19 *versus* non-COVID-19.

DISCUSIÓN

DISCUSIÓN GLOBAL Y SINTETIZADA SOBRE LOS PRINCIPALES HALLAZGOS DE LA TESIS

Las lesiones de piel asociadas al cuidado representan un fallo en la seguridad del paciente que genera altos costes económicos, consecuencias sanitarias y un gran impacto emocional en aquellos que las padecen. A pesar de los esfuerzos realizados para disminuir su incidencia y prevalencia, continúan siendo un problema común y presente de la atención en salud, por lo tanto, es necesario seguir investigando para disponer de información epidemiológica actualizada, identificar y establecer mejores estrategias de prevención y manejo de las heridas.

El rápido incremento de la demanda de atención de pacientes durante la pandemia de COVID-19, desbordó los Sistemas Sanitarios y, con ello, la mortalidad directa e indirecta aumentó significativamente.

A pesar de las limitaciones metodológicas inherentes al diseño de esta investigación y a la situación epidemiológica vivida durante el desarrollo de la investigación, que hemos tratado de minimizar en la medida de lo posible, este trabajo de Tesis Doctoral aporta a la comunidad científica los siguientes conocimientos: **i)** información epidemiológica sobre el alcance que la pandemia originada por el SARS-CoV-2 ha tenido sobre las lesiones de la piel y sus consecuencias en los pacientes, tanto en su salud, como en su calidad de vida; **ii)** nuevos perfiles epidemiológicos y clínicos de pacientes con riesgo de ulcerarse; **iii)** evidencia para implementar nuevas estrategias de prevención y cuidado/tratamiento que disminuyan la exposición del paciente hospitalizado a riesgos innecesarios y garanticen un cuidado de calidad y seguridad durante todo el proceso asistencial; y, por último, **iv)** estos hallazgos contribuirán a sensibilizar a los profesionales de la salud y a las administraciones públicas sobre la importancia de realizar un registro completo y uniforme que permita monitorizar correctamente la evolución de la carga asistencial de las heridas crónicas y en especial de las LPP.

Por todo lo expuesto, consideramos que este trabajo de investigación aborda un tema actual y oportuno en el tiempo, en el contexto de un Sistema Sanitario dinámico y accesible, que trata de hacer frente y adaptarse a cada situación compleja que se produce en la práctica asistencial y a futuras posibles nuevas situaciones, individuales o comunitarias.

CONCLUSIONES

Primera

Los protocolos de movilización temprana en pacientes hospitalizados en UCI no mostraron resultados significativos en la prevención de LPP. No obstante, se fortalece la recomendación de su uso en las guías de práctica clínica dada su repercusión favorable en múltiples aspectos clínicos frente a los poco riesgos descritos en su uso.

Segunda

La prevalencia global de heridas crónicas en el Servicio de Medicina Interna durante la primera ola se situó por debajo de la media encontrada en estudios nacionales. Desde el punto de vista etiológico predominan las LPP con un riesgo significativamente mayor en pacientes con diagnóstico de COVID-19.

Tercera

La prevalencia de episodios de LPP durante la primera ola de COVID-19, al igual que las heridas crónicas, se situó por debajo de la media de los estudios nacionales a pesar del incremento de hospitalizaciones en el servicio y de la situación especial de sobrecarga asistencial. Los pacientes con diagnóstico COVID-19 tendían a presentar hasta cuatro veces más riesgo de desarrollar LPP agudas (origen hospitalario), en comparación con los pacientes sin dicho diagnóstico.

Cuarta

El incremento de la carga de cuidados de heridas crónicas, principalmente de LPP, durante el año COVID-19 en el Servicio de Medicina Interna del CAUSA en comparación a los datos prepandémicos, pudo deberse a la combinación de múltiples factores de riesgo, entre los que destacan un perfil de paciente ingresado de edad avanzada, con múltiples comorbilidades y una sobrecarga asistencial con elevado flujo de ingresos y altas tasas de ocupación.

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ANEXOS

ANEXO I. ANEXO METODOLÓGICO

Cada uno de los objetivos específicos definidos en esta Tesis Doctoral ha marcado las pautas del diseño metodológico en cada una de las etapas de la investigación. Así, para dar cumplimiento a dichos objetivos se han llevado a cabo diferentes tipos o enfoques de investigación:

O.E.	*Diseño*	*Planteamiento*
1	Revisión sistemática y Metaanálisis.	Siguiendo protocolo PRISMA: – Se elaboró pregunta y se definieron sus componentes (PICOS). – Se estableció estrategia de búsqueda en las principales bases de datos. – Se identificaron y seleccionaron los artículos. – Se organizó y evaluó la calidad de la información. – Se analizó cualitativa y cuantitativamente.
2	Descriptivo longitudinal retrospectivo	**Periodo:** 1 de marzo a 1 de junio de 2020. **Ámbito:** Área de Salud de Salamanca. **Población:** Pacientes hospitalizados en las Unidades de Medina Interna del CAUSA. **Muestra:** 116 pacientes - 216 episodios de herida crónica. **Fuentes de datos:** Registros GACELA e Informe al Alta Hospitalaria. **Software:** SPSS 26.0
3	Descriptivo longitudinal retrospectivo	**Periodo:** 1 de marzo a 1 de junio de 2020. **Ámbito:** Área de Salud de Salamanca. **Población:** Pacientes hospitalizados en las Unidades de Medina Interna del CAUSA. **Muestra:** 101 pacientes – 171 episodios de LPP. **Fuentes de datos:** Registros GACELA e Informe al Alta Hospitalaria. **Software:** SPSS 26.0
4	Descriptivo longitudinal retrospectivo	**Periodo:** 1 de enero de 2019 al 1 de marzo de 2021. **Ámbito:** Área de Salud de Salamanca. **Población:** Pacientes hospitalizados en las Unidades de Medina Interna del CAUSA. **Muestra:** 932 pacientes – 1979 episodios de herida crónica. **Fuentes de datos:** Registros GACELA e Informe al Alta Hospitalaria. **Software:** SPSS 26.0

ANEXO II.

ÍNDICES DE CALIDAD DE LAS PUBLICACIONES APORTADAS

ARTÍCULO PRIMERO

Publicado en **INTERNATIONAL WOUND JOURNAL**			
Título	Can an early mobilisation programme prevent hospital-acquired pressure injures in an intensive care unit?: A systematic review and meta-analysis.		
Autores	Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Alonso-Sardón M.		
Revista	International Wound Journal JCR Abrev. Int Wound J.		
ISSN **E-ISSN**	1742-4801 1742-481X		
Editor	Wiley-Blackwell Publishing Ltd.		
Volumen	18		
Número	2		
Páginas	209-220		
DOI	10.1111/iwj.13516		
Publicado	Abril 2021		
Indexado	Noviembre 2020		
Indicadores de calidad de la revista	**WoS: Journal Citation Reports (JCR–SCIE edition)**		
	JIF 2020: **3.315**		
	Categoría:	Ranking - Cuartil - Percentil:	
	Dermatology	29/69 Q2	58.70
	Surgery	67/211 Q2	68.48
	SCOPUS y SCImago Journal Rank (SJR)		
	CiteScore: **5.0**	SJR 2020: **0.867**	SNIP 2020: **1.592**
	Categoría:	Ranking - Cuartil - Percentil:	
	Medicine: Dermatology	#20/117 Q1	83rd
	Medicine: Surgery	#46/422 Q1	89th

ARTÍCULO SEGUNDO

Publicado en **ADVANCES IN SKIN & WOUND CARE**			
Título	Clinical Burden of Inpatient Wound Care in Internal Medicine Units During the First Wave of COVID-19 Outbreak.		
Autores	Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Ruíz-Antúnez E, Nieto-García A, Alonso-Sardón M.		
Revista	Advance in Skin & Wound Care. JCR Abrev. Adv Skin Wound Care.		
ISSN **E-ISSN**	1527-7941 1538-8654		
Editor	Lippincott Williams and Wilkins Ltd.		
Volumen	35		
Número	6		
Páginas	1-7		
DOI	10.1097/01.ASW.0000824564.25976.c8		
Publicado	30 Junio 2022		
Indexado	16 Abril 2022		
Indicadores de calidad de la revista	**WoS: Journal Citation Reports (JCR–SCIE edition)**		
	JIF 2020: **2.347**		
	Categoría:	Ranking - Cuartil - Percentil:	
	Nursing	34/124 Q2	72.98
	Dermatology	43/69 Q3	38.41
	Surgery	111/211 Q3	47.63
	SCOPUS y SCImago Journal Rank (SJR)		
	CiteScore: **1.7**	SJR 2020: **0.426**	SNIP 2020: **0.994**
	Categoría:	Ranking - Cuartil - Percentil:	
	Nursing: Advanced and Specialized Nursing	#16/48 Q2	67th
	Medicine: Dermatology	#69/117 Q3	41st

ARTÍCULO TERCERO

<table>
<tr><td colspan="4">Publicado en PLOS ONE</td></tr>
<tr><td>Título</td><td colspan="3">Are there differences between COVID-19 and non-COVID-19 inpatient pressure injuries? Experiences in Internal Medicine Units.</td></tr>
<tr><td>Autores</td><td colspan="3">Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Ruiz-Antúnez E, Nieto-García A, Alonso-Sardón M.</td></tr>
<tr><td>Revista</td><td colspan="3">PLOS ONE.
JCR Abrev. Plos One.</td></tr>
<tr><td>ISSN
E-ISSN</td><td colspan="3">1932-6203
1932-6203</td></tr>
<tr><td>Editor</td><td colspan="3">Public Library of Science</td></tr>
<tr><td>Volumen</td><td colspan="3">17</td></tr>
<tr><td>Número</td><td colspan="3">2</td></tr>
<tr><td>Páginas</td><td colspan="3">e0263900</td></tr>
<tr><td>DOI</td><td colspan="3">10.1371/journal.pone.0263900</td></tr>
<tr><td>Publicado</td><td colspan="3">17 Febrero 2022</td></tr>
<tr><td>Indexado</td><td colspan="3">13 Abril 2022</td></tr>
<tr><td rowspan="6">Indicadores de calidad de la revista</td><td colspan="3">WoS: Journal Citation Reports (JCR–SCIE edition)</td></tr>
<tr><td colspan="3">JIF 2020: 3.240</td></tr>
<tr><td>Categoría:
Multidisciplinary Sciences</td><td colspan="2">Ranking - Cuartil - Percentil:
26/72 Q2 64.58</td></tr>
<tr><td colspan="3">SCOPUS y SCImago Journal Rank (SJR)</td></tr>
<tr><td>CiteScore: 5.3</td><td>SJR 2020: 0.990</td><td>SNIP 2020: 1.349</td></tr>
<tr><td>Categoría:
Multidisciplinary</td><td colspan="2">Ranking - Cuartil - Percentil:
#9/110 Q1 92nd</td></tr>
</table>

ARTÍCULO CUARTO

Enviado a **EUROPEAN JOURNAL OF INTERNAL MEDICINE**			
Título	Is the increase in record of skin wounds in hospitalized patients in Internal Medicine Units a side effect of the COVID-19 pandemic?		
Autores	Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Rubio-Gil FJ, Ruíz-Antúnez E, Nieto-García A, Alonso-Sardón M.		
Revista	European Journal of Internal Medicine. JCR Abrev. Eur J Intern Med.		
ISSN **E-ISSN**	0953-6205 1879-0828		
Editor	Elsevier		
Volumen			
Número			
Páginas			
DOI			
Publicado			
Indexado			
Indicadores de calidad de la revista	**WoS: Journal Citation Reports (JCR–SCIE edition)**		
	JIF 2020: 4.624		
	Categoría: *Medicine, General & Internal*	Ranking - Cuartil - Percentil: 37/167 Q1 78.14	
	SCOPUS y SCImago Journal Rank (SJR)		
	CiteScore: **5.4**	SJR 2020: **0.894**	SNIP 2020: **1.189**
	Categoría: *Medicine: Internal Medicine*	Ranking - Cuartil - Percentil: #29/121 Q1 76th	

ANEXO III.

AUTORIZACIÓN COMITÉ DE ÉTICA DE LA INVESTIGACIÓN CLÍNICA

COMPLEJO ASISTENCIAL UNIVERSITARIO D SALAMANCA
Paseo de San Vicente, 58-182
37007 Salamanca
Comité Ético de Investigación con Medicamentos
Teléfono: 923 29 11 00 – Ext. 55 515

Sacyl
E-mail: comite.etico.husa@saludcastillayleon.es

EL COMITE DE ETICA DE LA INVESTIGACION CON MEDICAMENTOS DEL AREA DE SALUD DE SALAMANCA,

I N F O R M A

Que el Proyecto de Investigación presentado por Dña ADELA CARPIO PÉREZ

Titulado:

ÚLCERAS POR PRESIÓN: UNA EPIDEMIA PREVENIBLE EN EL CONTEXTO DE UNA PRÁCTICA ASISTENCIAL SEGURA

Que presenta como Investigador/a responsable, SE AJUSTA A LAS NORMAS ÉTICAS Y DE BUENA PRÁCTICA CLÍNICA, establecidas para tales estudios.

Código CEIm: PI **2019 03 208**

Y para que conste, lo firma en Salamanca con fecha 25 de marzo de 2019

COMPLEJO UNIVERSITARIO DE SALAMANCA
COMITÉ DE ÉTICA DE LA INVESTIGACIÓN CON MEDICAMENTOS

LA SECRETARIA TÉCNICA

Fdo.: Dra. D.ª María Belén Vidriales Vicente

ANEXO IV. AUTORIZACIÓN DE CO-AUTORÍA

VNiVERSiDAD D SALAMANCA
CAMPUS DE EXCELENCIA INTERNACIONAL

ESCUELA DE DOCTORADO
EDIFICIO MULTIUSOS I+D+I
C/ ESPEJO Nº 2 – 1ª PLANTA. 37007 SALAMANCA
doctorado.usal.es

IMPRIMIR RESTABLECER

D. /Dª. MONTSERRAT ALONSO SARDÓN

HAGO CONSTAR:

Que soy COAUTOR/A de los siguientes trabajos:

1. Can an early mobilisation programme prevent hospital-acquired pressure injures in an intensive care unit?: A systematic review and meta-analysis.
Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Alonso-Sardón M.
Int Wound J. 2021 Apr;18(2):209-220.
doi: 10.1111/iwj.13516

2. Are there differences between COVID-19 and non-COVID-19 inpatient pressure injuries? Experiences in Internal Medicine Units.
Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Ruiz-Antúnez E, Nieto-García A, Alonso-Sardón M.
PLoS One. 2022 Feb 17;17(2):e0263900.
doi: 10.1371/journal.pone.0263900

3. Clinical Burden of Inpatient Wound Care in Internal Medicine Units During the First Wave of COVID-19 Outbreak.
Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Ruiz-Antúnez E, Nieto-García A, Alonso-Sardón M.
Adv Skin Wound Care. 2022 Jun 1;35(6):1-7.
doi: 10.1097/01.ASW.0000824564.25976.c8

4. Is the increase in record of skin wounds in hospitalized patients in Internal Medicine Units a side effect of the COVID-19 pandemic?
Leticia Nieto-García, Adela Carpio-Pérez, María Teresa Moreiro-Barroso, Francisco Javier Rubio Gil, Emilia Ruiz-Antúnez, Ainhoa Nieto-García, Montserrat Alonso-Sardón.
Eur J Intern Med. (Enviado y pendiente de aceptación)

Y MANIFIESTO QUE:

☐ Como COAUTOR/A NO DOCTOR/A del trabajo del doctorando _____ expreso mi RENUNCIA a presentar el artículo como parte de otra Tesis Doctoral.

☑ Como COAUTOR/A del trabajo del doctorando LETICIA NIETO GARCÍA acepto que dicho trabajo sea presentado como parte de su Tesis Doctoral y declaro que el doctorando es el autor principal de la investigación recogida en estos trabajos.

Salamanca a 1 de junio de 2022

ALONSO SARDON MONTSERRAT - 10196322P
Firmado digitalmente por ALONSO SARDON MONTSERRAT - 10196322P
Fecha: 2022.06.16 12:15:49 +02'00'

Fdo: Montserrat Alonso Sardón

COMISIÓN ACADÉMICA DEL PROGRAMA DE DOCTORADO

VNiVERSiDAD D SALAMANCA
CAMPUS DE EXCELENCIA INTERNACIONAL

ESCUELA DE DOCTORADO
EDIFICIO MULTIUSOS I+D+I
C/ ESPEJO Nº 2 – 1ª PLANTA. 37007 SALAMANCA
doctorado.usal.es

IMPRIMIR RESTABLECER

D. /Dª. ADELA CARPIO PÉREZ

HAGO CONSTAR:

Que soy COAUTOR/A de los siguientes trabajos:

1. Can an early mobilisation programme prevent hospital-acquired pressure injures in an intensive care unit?: A systematic review and meta-analysis.
Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Alonso-Sardón M.
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Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Ruiz-Antúnez E, Nieto-García A, Alonso-Sardón M.
PLoS One. 2022 Feb 17;17(2):e0263900.
doi: 10.1371/journal.pone.0263900

3. Clinical Burden of Inpatient Wound Care in Internal Medicine Units During the First Wave of COVID-19 Outbreak.
Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Ruíz-Antúnez E, Nieto-García A, Alonso-Sardón M.
Adv Skin Wound Care. 2022 Jun 1;35(6):1-7.
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4. Is the increase in record of skin wounds in hospitalized patients in Internal Medicine Units a side effect of the COVID-19 pandemic?
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Eur J Intern Med. (Enviado y pendiente de aceptación)

Y MANIFIESTO QUE:

☑ Como COAUTOR/A NO DOCTOR/A del trabajo del doctorando LETICIA NIETO GARCÍA expreso mi RENUNCIA a presentar el artículo como parte de otra Tesis Doctoral.

☑ Como COAUTOR/A del trabajo del doctorando LETICIA NIETO GARCÍA acepto que dicho trabajo sea presentado como parte de su Tesis Doctoral y declaro que el doctorando es el autor principal de la investigación recogida en estos trabajos.

Salamanca a 16 de junio de 2022

Firmado por CARPIO PEREZ ADELA - 07879318R el día

Fdo: Adela Carpio Pérez

COMISIÓN ACADÉMICA DEL PROGRAMA DE DOCTORADO

VNIVERSIDAD D SALAMANCA
CAMPUS DE EXCELENCIA INTERNACIONAL

ESCUELA DE DOCTORADO
EDIFICIO MULTIUSOS I+D+i
C/ ESPEJO Nº 2 – 1ª PLANTA. 37007 SALAMANCA
doctorado.usal.es

IMPRIMIR RESTABLECER

D. /Dª. Ainhoa Nieto García

HAGO CONSTAR:

Que soy COAUTOR/A de los siguientes trabajos:

1. Are there differences between COVID-19 and non-COVID-19 inpatient pressure injuries? Experiences in Internal Medicine Units.
Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Ruiz-Antúnez E, Nieto-García A, Alonso-Sardón M.
PLoS One. 2022 Feb 17;17(2):e0263900.
doi: 10.1371/journal.pone.0263900

2. Clinical Burden of Inpatient Wound Care in Internal Medicine Units During the First Wave of COVID-19 Outbreak.
Nieto-García L, Carpio-Pérez A, Moreiro-Barroso MT, Ruiz-Antúnez E, Nieto-García A, Alonso-Sardón M.
Adv Skin Wound Care. 2022 Jun 1;35(6):1-7.
doi: 10.1097/01.ASW.0000824564.25976.c8

3. Is the increase in record of skin wounds in hospitalized patients in Internal Medicine Units a side effect of the COVID-19 pandemic?
Leticia Nieto-García1, Adela Carpio-Pérez2, María Teresa Moreiro-Barroso3, Francisco Javier Rubio Gil4, Emilia Ruiz-Antúnez5, Ainhoa Nieto-García6, Montserrat Alonso-Sardón.
Eur J Intern Med. (Enviado y pendiente de aceptación)

Y MANIFIESTO QUE:

☑ Como COAUTOR/A NO DOCTOR/A del trabajo del doctorando LETICIA NIETO GARCÍA expreso mi RENUNCIA a presentar el artículo como parte de otra Tesis Doctoral.

☑ Como COAUTOR/A del trabajo del doctorando LETICIA NIETO GARCÍA acepto que dicho trabajo sea presentado como parte de su Tesis Doctoral y declaro que el doctorando es el autor principal de la investigación recogida en estos trabajos.

Salamanca a 16 de junio de 2022

Fdo: A. Nieto

COMISIÓN ACADÉMICA DEL PROGRAMA DE DOCTORADO

ANEXO V. PRESENTACIONES EN CONGRESOS

CERTIFICADO

Por su contribución en la modalidad de PÓSTER en el "V Congreso Internacional en Contextos Clínicos y de la Salud", con el título:

EFECTOS DE UN PROGRAMA DE MOVILIZACIÓN PRECOZ EN LA PREVENCIÓN DE ÚLCERAS POR PRESIÓN EN UNIDADES DE CUIDADOS INTENSIVOS

Cuyos autores son:

LETICIA NIETO GARCIA; MONTSERRAT ALONSO SARDÓN; ADELA CARPIO PÉREZ; MARIA TERESA MOREIRO BARROSO; NATALIA MONTES CARRASCO; ANA BELÉN CALVO VERA

Además, dicha aportación está PUBLICADA en el libro de Actas del V Congreso Internacional en Contextos Clínicos y de la Salud. Volumen I, con ISBN: 978-84-09-10587-8 y Depósito Legal: AL 890-2019.

Dicho congreso se ha celebrado durante los días 4 y 5 de abril de 2019 en Murcia (España), con una duración de 20 horas, organizado por la Asociación Universitaria de Educación y Psicología [Sociedad Miembro Adherida a COSCE-Confederación de Sociedades Científicas de España], y la Asociación University of Scientific Formation Psychology and Education Research, (entidades sin fin de lucro al amparo de la Ley 1/2002 donde en sus estatutos constan de forma expresa la formación y la investigación e inscritas en el Registro de Asociaciones de la Junta de Andalucía con los números: 4922, Sección 1, y 6372, Sección 1; respectivamente), y el Grupo de Investigación SEJ- 473 de la Universidad de Almería, perteneciente al Plan Andaluz de Investigación PAIDI, de la Consejería de Economía, Conocimiento, Empresas y Universidad de la Junta de Andalucía.
Dicha actividad cuenta con la Resolución Favorable de Reconocimiento de Interés Científico-Sanitario concedida por el Ministerio de Sanidad, Consumo y Bienestar Social (Referencia: S201910200000043) y la Consejería de Salud de la Región de Murcia (Exp: J1/2019).

Murcia, a 5 de abril de 2019

Presidenta del Congreso

Fdo.: Dña. María del Mar Molero Jurado

2º CONGRESO NACIONAL MULTIDISCIPLINAR COVID19 de las Sociedades Científicas de España

DEL 12 AL 16 DE ABRIL DE 2021

VIRTUAL

2congresocovid.es

Certificado de póster

A favor de:

Leticia Nieto García, Adela Carpio Pérez, María Teresa Moreiro Barroso, Emilia Ruíz Antúnez, María Antonia Simal Calvo, Cecilia Vicente Hernández, Ainhoa Nieto García, Laura María Merino Herrero, Montserrat Alonso Sardón

por la presentación como PÓSTER del trabajo:

Episodios De úlcera Cutánea En Pacientes Hospitalizados: COVID-19 Vs. No-COVID-19

presentado en el 2ºCongreso Nacional Multidisciplinar Covid19 de las Sociedades Científicas de España, celebrado del 12 al 16 de Abril 2021.

Y para que conste donde convenga se expide el presente certificado.

Dr. Juan Antonio Riesco Miranda
Presidente del Comité Organizador

Dr. David de la Rosa Carrillo
Presidente del Comité Científico

Dr. Carlos Jiménez-Ruiz
Presidente del Congreso

V CONGRESO INTERNACIONAL DE INTERVENCIÓN E INVESTIGACIÓN EN SALUD

Murcia 22 y 23 de Febrero de 2022

CERTIFICADO

Por su contribución en la modalidad de PÓSTER en el "V Congreso Internacional de Intervención e Investigación en la Salud", con el título:

MEDIDA DE LA FRECUENCIA DE LESIONES POR PRESIÓN EN EL SERVICIO DE MEDICINA INTERNA DE SALAMANCA DURANTE LA PRIMERA OLA SARS-COV-2

Cuyos autores son:

LETICIA NIETO GARCIA (DNI: 70865245Z); ADELA CARPIO PÉREZ (DNI: 07879318R); MARIA TERESA A MOREIRO BARROSO (DNI: 11773966J); ANA MENOR ODRIOZOLA (DNI: 13132558H); AINHOA NIETO GARCIA (DNI: 70898234K); ANA LOPEZ GUTIERREZ (DNI: 70894640S); MONTSERRAT ALONSO SARDON (DNI: 10196322P)

Dicha aportación está PUBLICADA en el libro de Actas del V Congreso Internacional de Intervención e Investigación en la Salud. Volumen I con ISBN: 978-84-09-38694-9 y Depósito Legal: AL 617-2022

El Congreso se ha celebrado durante los días 22 y 23 de febrero de 2022, con una duración de 20 horas, organizado por la Sociedad Científica Española para la Investigación y la Formación en Ciencias de la Salud (entidad sin fin de lucro al amparo de la Ley 1/2002 donde en sus estatutos constan de forma expresa la formación y la investigación e inscrita en el Registro de Asociaciones de la Junta de Andalucía con el número: 1-4922, Sección 1), en colaboración con el Grupo de Investigación SEJ-473 de la UNIVERSIDAD DE ALMERÍA, perteneciente al Plan Andaluz de Investigación PAIDI, de la Consejería de Economía, Conocimiento, Empresas y Universidad de la Junta de Andalucía, y Cinfoper. Dicha actividad cuenta con la Resolución Favorable de Reconocimiento de Interés Sanitario concedida por la Comunidad de Murcia (Orden de fecha, 1 de diciembre de 2021, Expte.17/2021, al número de registro 202190000630394), igualmente dicha actividad ha sido avalada por la Sociedad Española de Educación Médica (SEDEM).

Murcia, 23 de febrero de 2022

SOCIEDAD CIENTÍFICA ESPAÑOLA PARA LA INVESTIGACIÓN Y FORMACIÓN EN CIENCIAS DE LA SALUD

Fdo.: Dr. José Jesús Gázquez Linares
Presidente del Congreso

V CONGRESO INTERNACIONAL DE INTERVENCIÓN E INVESTIGACIÓN EN SALUD

Murcia 22 y 23 de Febrero de 2022

CERTIFICADO

Por su contribución en la modalidad de PÓSTER en el "V Congreso Internacional de Intervención e Investigación en la Salud", con el título:

COMORBILIDADES ASOCIADAS A LAS LESIONES POR PRESIÓN EN PACIENTES CON DIAGNÓSTICO COVID-19 VERSUS SIN DIAGNÓSTICO COVID-19

Cuyos autores son:

LETICIA NIETO GARCIA (DNI: 70865245Z); ADELA CARPIO PÉREZ (DNI: 07879318R); MARIA TERESA A MOREIRO BARROSO (DNI: 11773966J); ANA MENOR ODRIOZOLA (DNI: 13132558H); ANA LOPEZ GUTIERREZ (DNI: 70894640S); AINHOA NIETO GARCIA (DNI: 70898234K); MONTSERRAT ALONSO SARDON (DNI: 10196322P)

Dicha aportación está PUBLICADA en el libro de Actas del V Congreso Internacional de Intervención e Investigación en la Salud. Volumen II con ISBN: 978-84-09-38695-6 y Depósito Legal: AL 618-2022

El Congreso se ha celebrado durante los días 22 y 23 de febrero de 2022, con una duración de 20 horas, organizado por la Sociedad Científica Española para la Investigación y la Formación en Ciencias de la Salud (entidad sin fin de lucro al amparo de la Ley 1/2002 donde en sus estatutos constan de forma expresa la formación y la investigación e inscrita en el Registro de Asociaciones de la Junta de Andalucía con el número: 1-4922, Sección 1), en colaboración con el Grupo de Investigación SEJ-473 de la UNIVERSIDAD DE ALMERÍA, perteneciente al Plan Andaluz de Investigación PAIDI, de la Consejería de Economía, Conocimiento, Empresas y Universidad de la Junta de Andalucía, y Cinfoper. Dicha actividad cuenta con la Resolución Favorable de Reconocimiento de Interés Sanitario concedida por la Comunidad de Murcia (Orden de fecha, 1 de diciembre de 2021, Expte.17/2021, al número de registro 202190000630394), igualmente dicha actividad ha sido avalada por la Sociedad Española de Educación Médica (SEDEM).

Murcia, 23 de febrero de 2022

SOCIEDAD CIENTÍFICA ESPAÑOLA PARA LA INVESTIGACIÓN Y FORMACIÓN EN CIENCIAS DE LA SALUD

Fdo.: Dr. José Jesús Gázquez Linares
Presidente del Congreso

V CONGRESO INTERNACIONAL DE INTERVENCIÓN E INVESTIGACIÓN EN SALUD

Murcia 22 y 23 de Febrero de 2022

CERTIFICADO

Por su contribución en la modalidad de PÓSTER en el "V Congreso Internacional de Intervención e Investigación en la Salud", con el título:

INDICADORES CLÍNICO-EPIDEMIOLÓGICOS DE LAS LESIONES POR PRESIÓN DURANTE LA PRIMERA OLA DE SARS-COV-2

Cuyos autores son:

LETICIA NIETO GARCIA (DNI: 70865245Z); ADELA CARPIO PÉREZ (DNI: 07879318R); MARIA TERESA A MOREIRO BARROSO (DNI: 11773966J); ANA MENOR ODRIOZOLA (DNI: 13132558H); AINHOA NIETO GARCIA (DNI: 70898234K); ANA LOPEZ GUTIERREZ (DNI: 70894640S); MONTSERRAT ALONSO SARDON (DNI: 10196322P)

Dicha aportación está PUBLICADA en el libro de Actas del V Congreso Internacional de Intervención e Investigación en la Salud. Volumen III con ISBN: 978-84-09-38696-3 y Depósito Legal: AL 619-2022

El Congreso se ha celebrado durante los días 22 y 23 de febrero de 2022, con una duración de 20 horas, organizado por la Sociedad Científica Española para la Investigación y la Formación en Ciencias de la Salud (entidad sin fin de lucro al amparo de la Ley 1/2002 donde en sus estatutos constan de forma expresa la formación y la investigación e inscrita en el Registro de Asociaciones de la Junta de Andalucía con el número: 1-4922, Sección 1), en colaboración con el Grupo de Investigación SEJ-473 de la UNIVERSIDAD DE ALMERÍA, perteneciente al Plan Andaluz de Investigación PAIDI, de la Consejería de Economía, Conocimiento, Empresas y Universidad de la Junta de Andalucía, y Cinfoper. Dicha actividad cuenta con la Resolución Favorable de Reconocimiento de Interés Sanitario concedida por la Comunidad de Murcia (Orden de fecha, 1 de diciembre de 2021, Expte.17/2021, al número de registro 202190000630394), igualmente dicha actividad ha sido avalada por la Sociedad Española de Educación Médica (SEDEM).

Murcia, 23 de febrero de 2022

SOCIEDAD CIENTÍFICA ESPAÑOLA PARA LA INVESTIGACIÓN Y FORMACIÓN EN CIENCIAS DE LA SALUD

Fdo.: Dr. José Jesús Gázquez Linares
Presidente del Congreso