



CAREGIVER EDUCATION FOR PRESSURE INJURY PREVENTION AMONG DEPENDENT OLDER ADULTS: A QUASI-EXPERIMENTAL STUDY

EDUCAÇÃO DE CUIDADORES PARA A PREVENÇÃO DE LESÕES POR PRESSÃO EM IDOSOS DEPENDENTES: UM ESTUDO QUASE-EXPERIMENTAL

EDUCACIÓN DIRIGIDA A CUIDADORES PARA PREVENIR ÚLCERAS POR PRESIÓN EN ADULTOS MAYORES DEPENDIENTES: ESTUDIO CUASIEXPERIMENTAL

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RESUMO

Objetivo: Avaliar os efeitos de um sistema de apoio e educação para cuidadores sobre o conhecimento dos cuidadores, as práticas de prevenção de lesões por pressão e a incidência de lesões por pressão em idosos dependentes. **Método:** Foi realizado um estudo quase-experimental, com dois grupos e avaliação pré e pós-intervenção, envolvendo 80 díades cuidador-paciente recrutadas em quatro hospitais da Região de Saúde 4, na Tailândia. O Grupo Experimental recebeu um sistema digital de apoio baseado na autoeficácia, que incluía registros diários das práticas, vídeos demonstrativos, mensagens de lembrete, consultas de enfermagem e suporte para o gerenciamento do estresse, enquanto o Grupo Controle recebeu os cuidados habituais. Os dados foram analisados por meio de estatística descritiva, teste t pareado, teste t independente e teste do qui-quadrado. **Resultados:** Após a exposição ao sistema digital de apoio baseado na autoeficácia, o Grupo Experimental apresentou escores de conhecimento significativamente mais altos do que o Grupo Controle (12,13±1,84 versus 10,88±2,16; p=0,007) e escores totais mais altos de práticas preventivas (28,40±5,84 versus 25,45±6,94; p=0,043). A prática de higienização da pele também apresentou diferença significativa (p=0,023). A incidência de lesões por pressão foi menor no Grupo Experimental do que no Grupo Controle (10,0% versus 12,5%), porém a diferença não foi estatisticamente significativa (p=0,72). **Conclusão:** O sistema aprimorou o conhecimento e as práticas preventivas dos cuidadores e deve ser integrado ao planejamento da alta e aos cuidados de transição. **Descritores:** Cuidadores; Lesão por Pressão; Educação em Saúde; Idoso; Aplicativos Móveis; Autoeficácia.

ABSTRACT

Objective: To assess the effects of a caregiver support and education system on caregivers' knowledge, pressure injury preventive practices, and pressure injury incidence among dependent older adults. **Method:** A quasi-experimental two-group pre- and post-test study was conducted with 80 caregiver-patient dyads recruited from four hospitals in Health Region 4, Thailand. The Experimental Group received a self-efficacy-based digital support system that included daily practice logs, demonstration videos, reminder messages, nurse consultations and stress management support, whereas the Control Group was provided the usual care. The data were analyzed using descriptive statistics, paired t test, independent t test, and chi-square test. **Results:** After being exposed to the self-efficacy-based digital support system, the Experimental Group had significantly higher knowledge scores than the Control Group (12.13±1.84 versus 10.88±2.16; p=0.007) and higher total preventive practice scores (28.40±5.84 versus 25.45±6.94; p=0.043). The skin cleaning practice also differed significantly (p=0.023). Pressure injury incidence was lower in the Experimental Group than in the Control Group (10.0% versus 12.5%), but the difference was not statistically significant (p=0.72). **Conclusion:** The system improved caregivers' knowledge and preventive practices and should be integrated into discharge planning and transitional care.

Descriptors: Caregivers; Pressure Ulcer; Health Education; Aged; Mobile Apps; Self-Efficacy

RESUMEN

Objetivo: Evaluar los efectos ejercidos por un sistema de apoyo y educación dirigido a cuidadores sobre sus conocimientos y prácticas para prevenir úlceras por presión, además de sobre la incidencia de estas lesiones en adultos mayores dependientes. **Método:** Se realizó un estudio cuasiexperimental del tipo pre y post test con dos grupos, abarcando un total de 80 díadas cuidador-paciente reclutadas en cuatro hospitales de la Región 4 de Salud de Tailandia. Al Grupo Experimental se le brindó un sistema de apoyo digital basado en la autoeficacia que incluía registros de prácticas diarias, videos de demostración, mensajes recordatorios, consultas de Enfermería y asistencia para manejar el estrés; en cambio, al Grupo Control se le ofreció el cuidado habitual. Los datos se analizaron utilizando estadística descriptiva, prueba t pareada, prueba t para muestras independientes y prueba chi-cuadrado. **Resultados:** Después de interactuar con el sistema de apoyo digital basado en la autoeficacia, el Grupo Experimental obtuvo puntuaciones significativamente más altas que el Grupo Control en sus conocimientos (12,13±1,84 versus 10,88±2,16; p=0,007) y puntuaciones totales también más elevadas en cuanto a prácticas preventivas (28,40±5,84 versus 25,45±6,94; p=0,043); la práctica de limpieza de la piel también difirió significativamente (p=0,023). La incidencia de úlceras por presión fue más baja en el Grupo Experimental que en el Grupo Control (10,0% versus 12,5%), pero la diferencia no fue estadísticamente significativa (p=0,72). **Conclusión:** El sistema mejoró los conocimientos y las prácticas preventivas de los cuidadores y se lo debería integrar a la planificación del alta hospitalaria y al cuidado de transición.

Descriptores: Cuidadores; Úlcera por Presión; Educación para la Salud; Adultos Mayores; Aplicaciones Móviles; Autoeficacia

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What is already known:

- Pressure injury prevention requires consistent daily practices by family caregivers of dependent older adults.
- Caregiver education can improve knowledge, but one-time discharge teaching may be insufficient for sustained home care.
- Digital health tools may provide repeated learning and professional support for family caregivers.

What this study adds:

- A self-efficacy-based digital media-assisted caregiver support system significantly improved caregivers' knowledge and preventive practices.
- The skin cleaning practice showed a significant improvement when compared to usual care.
- Pressure injury incidence was lower in the intervention group but it did not differ significantly, indicating the need for longer follow-up.

INTRODUCTION

Population ageing is a major public health challenge worldwide. The number of people aged at least 60 years old is increasing rapidly, and Thailand is experiencing a demographic transition that has intensified the demand for long-term care, family caregiving and health services for dependent older adults⁽¹⁻³⁾.

These older adults oftentimes have restricted mobility, multiple chronic diseases, impaired activities of daily living and continuous care needs. These conditions increase the risk of pressure ulcers, localized injuries to the skin and/or underlying tissue, usually over a bony prominence and resulting from pressure or pressure combined with shear^(4,5). Pressure injuries are also a patient safety and care quality indicator because they are associated with pain, infection, longer hospitalizations, increased costs and greater family and health-system burdens^(6,7).

Pressure injury prevention requires risk assessment, skin inspection, repositioning, moisture control, nutritional support and appropriate pressure-redistributing devices^(4,5). In daily care, family caregivers are central to prevention because they provide repositioning, hygiene care, skin observation, feeding assistance and care continuity after hospital discharge. However, many caregivers have limited structured training and may lack confidence in performing evidence-based prevention practices⁽⁸⁻¹³⁾.

Education for patients and lay caregivers can improve knowledge, participation and preventive behaviors related to pressure injury prevention^(8,9). Nevertheless, one-time discharge education may be insufficient for caregivers who must manage complex care tasks at home. Digital health interventions can support family caregivers by allowing repeated access to educational content, feedback and communication with health professionals^(14,15). Digital media-assisted caregiver support system interventions have also shown benefits in self-management, self-efficacy and health behavior outcomes in older adults and populations suffering from chronic diseases⁽¹⁶⁾.

Bandura's Self-efficacy Theory provides a relevant foundation for caregiver support interventions. It proposes that individuals are more likely to initiate and sustain health behaviors when they believe they can perform them successfully. Self-efficacy can be strengthened through mastery experiences, vicarious experiences, verbal persuasion and management of physiological and affective states⁽¹⁷⁾. Applying this theory to caregiver education may help transform knowledge into sustained preventive practices.

Despite growing evidence on caregiver education for

pressure injury prevention, a limited number of studies have examined theory-based digital support systems that integrate repeated learning, nurse consultation, behavioral reinforcement and emotional support for family caregivers of dependent older adults in hospital-to-home transitional care settings in Thailand. This gap is important because caregiver knowledge and preventive practices are proximal outcomes that may influence Nursing assistance quality and care continuity after discharge.

This study was conducted to assess the effects of a caregiver support and education system on caregivers' knowledge, pressure injury preventive practices, and pressure injury incidence among dependent older adults.

METHOD

Design

This quasi-experimental study used a two-group pre- and post-test design to compare the effects of a caregiver support and education system to usual care.

Participants and setting

The study population was comprised by dependent older adults aged at least 60 years old admitted to orthopedic surgical or medical wards in four hospitals from Health Region 4, Thailand, as well as their primary caregivers. The sample included 80 caregiver-patient dyads: 40 in the Experimental Group and another 40 in the Control Group. Sample size was calculated using G*Power with a significance level of 0.05, power of 0.80 and effect size of 0.80⁽¹⁸⁾. The calculated size was increased to accommodate possible attrition and maintain balance across the hospitals. The overall data collection period was separated from the intervention exposure period. Each caregiver-patient dyad in the Experimental Group was subjected to the intervention for one week. An outcome reassessment was conducted after the intervention period, and pressure injury incidence was followed-up one week after the patients returned to their homes. The overall data collection was conducted over a six-month period; however, the intervention exposure for each participant was one week.

Sampling and allocation

Multi-stage sampling was applied. Four hospitals in Health Region 4 were selected. Eligible caregiver-patient dyads were screened using the same inclusion and exclusion criteria in both groups. For being a quasi-experimental

study rather than a randomized controlled trial, the participants were allocated using non-random allocation while considering key baseline characteristics such as gender, age and disease group to improve comparability between the groups. The same screening criteria were applied to both groups, including dependence assessed by the Barthel Activities of Daily Living Index, pressure injury risk assessed by the Braden Scale, absence of pressure injury at baseline and comparable major disease groups. The baseline data were collected before the intervention to evaluate group comparability.

Eligibility criteria

The inclusion criteria for the patients were age at least 60 years old, stroke diagnosis or admission for knee or hip arthroplasty, Braden Scale score of 13 or lower, Barthel Activities of Daily Living Index score of 0-8, Glasgow Coma Scale score of 9 or higher, absence of pressure injuries at admission and having the same primary caregiver throughout the study. In turn, the inclusion criteria for the caregivers were age 18-55 years old, being the primary caregiver, ability to communicate, read and write Thai, having a smartphone or contact number and providing due informed consent.

Discontinuation criteria

The discontinuation criteria after enrollment included transfer to an intensive care unit or another hospital, development of severe sepsis or heart failure during the study, caregiver inability to continue caregiving until study completion, physical or mental health conditions that interfered in participation or withdrawal by the patient or caregiver.

Intervention

The intervention was a digital media-assisted caregiver support and education system developed based on Bandura's Self-efficacy Theory. It was not a full standalone mobile app; rather, it combined structured caregiver education, digital media, daily practice records, reminder messages and nurse consultations. Each caregiver in the Experimental Group was subjected to the intervention for one week.

The intervention consisted of six main components: 1) Education on the causes, risk factors, assessment and prevention for pressure injuries; 2) Demonstration and guided practice on skin inspection, skin cleaning, positioning, repositioning and use of pressure-reducing devices; 3) Approximately five educational videos delivered through digital media platforms such as TikTok and YouTube for repeated review; 4) A daily care practice record for documenting repositioning, skin care, lotion use and observation of abnormal skin changes; 5) Daily reminder messages sent once a day to encourage preventive care practices; and 6) Access to nurse consultations when caregivers encountered care-related problems.

The system was designed to provide mastery experiences, vicarious experiences through demonstration videos, verbal persuasion through reminder messages and feedback,

and emotional support through nurse consultations.

Usual care

The Control Group was offered the usual Nursing care provided by the hospital. This habitual assistance included routine ward care and general instructions from nurses regarding care for dependent older adults and prevention of complications according to each patient's condition. The Control Group was not offered the structured digital media package, daily practice record, planned reminder messages, structured feedback or nurse consultations channel specifically arranged for this study.

Instruments

The research instruments included screening tools, outcome measurement tools, demographic record forms and a pressure injury incidence record. The screening tools were the Braden Scale for predicting pressure ulcer risk, the Barthel Activities of Daily Living Index and the Glasgow Coma Scale. The Barthel Activities of Daily Living Index consisted of 10 items with a total score of 20, with lower values indicating greater dependence. The Glasgow Coma Scale assessed eye opening, motor response and verbal response, with a total score of 15. The caregiver knowledge test on pressure injury prevention had 15 true-or-false items, also with a total score of 15. Scores of 60% or higher were considered as a pass. The caregiver preventive practice assessment form consisted of 20 items covering five domains: Caregiver and skin assessment, Risk assessment and management, Skin cleaning and care, Nutritional care, Positioning/Repositioning and Use of pressure-reducing devices.

The caregivers answered the questionnaires by themselves when possible. If any of them had difficulty reading, the researcher read the questions aloud and recorded the answers. The preventive practices were assessed using caregiver self-report and researcher observation when applicable. Pressure injury incidence was recorded by the researcher based on skin assessments and patient records. The instruments were reviewed by three experts, yielding a content validity index of 0.81; in turn, reliability testing yielded a coefficient of 0.93.

Data collection

The baseline data were collected from caregivers and patients in both groups before the intervention. Eligible caregiver-patient dyads were screened using the Braden Scale, the Barthel Activities of Daily Living Index and the Glasgow Coma Scale. The Experimental Group was then exposed to the digital media-assisted caregiver support and education system for one week, whereas the Control Group was offered usual care. During the intervention period, the Experimental Group caregivers used educational videos, daily practice records, reminder messages and nurse consultations as necessary. After one week, the caregivers' knowledge and preventive practice scores were reassessed. Pressure injury incidence among the patients was followed-up and recorded one week after they returned

to their homes.

Data analysis

The data were analyzed using IBM SPSS Statistics. Frequencies, percentages, mean values and standard deviations were employed to describe caregiver and patient characteristics. The paired t test was employed to compare pre- and post-test scores within groups. The independent t test compared post-test scores between groups. The Chi-square test compared pressure injury incidence. Statistical significance was set at 0.05. No participants withdrew after allocation, and no missing outcome data were reported. Therefore, all 80 caregiver-patient dyads were included in the final analysis using a complete-case/per-protocol approach. The baseline characteristics were compared between groups using the Chi-square or Fisher's Exact test for categorical variables and an independent t test for continuous variables, as appropriate.

Ethical aspects

The study followed ethical principles for research involving human participants. The subjects were informed about objectives, procedures, benefits, risks, confidentiality and the right to withdraw before providing their written informed consent. Data collection was conducted after Institutional Review Board approval (No. IRB 2025/02; January 24th, 2025). If a participant had difficulty reading, the researcher read the questionnaire aloud and the participant recorded the answers. Disease-related information was collected from medical records.

RESULTS

The baseline characteristics were mostly comparable between groups (Table 1). The proportion of female caregivers was 75.0% in the Experimental Group and 85.0% in the Control Group ($p=0.402$). Most caregivers were relatives of the patients, although this variable differed significantly between groups (95.0% versus 77.5%; $p=0.048$). Most caregivers had never undergone caregiver training before the study (95.0% versus 87.5%; $p=0.432$) and most of them provided care for more than four hours per day (97.5% versus 95.0%; $p=1.000$). The patients' gender, major disease groups and hypertension as comorbidity did not differ significantly between the groups. The pre-test knowledge and preventive practice scores were also not significantly different between the groups, indicating that they were generally comparable before the intervention, except for caregiver kinship to the patient.

The intra-group comparisons showed that both groups had significant increases in knowledge and preventive practice scores after the intervention period (Table 2).

The post-test comparisons showed that the Experimental Group had significantly higher knowledge and total preventive practice scores than the Control Group. Among the practice domains, Skin cleaning was significantly higher in the Experimental Group (Table 3).

Pressure injuries were detected in 4 out of 40 patients in the Experimental Group and in 5 out of 40 patients in the Control Group. Although the incidence was lower in the Experimental Group than in the Control Group (10.0% versus 12.5%), the difference was not statistically significant ($\chi^2=0.13$; $p=0.72$).

Table 1 – Baseline characteristics corresponding to the caregivers and patients. Health Region 4, Thailand, 2025 (n=80 dyads)

Characteristics	Experimental Group n (%)	Control Group n (%)	p-value
Female caregivers	30 (75.0)	34 (85.0)	0.402
Caregivers as relative	38 (95.0)	31 (77.5)	0.048
No previous caregiver training	38 (95.0)	35 (87.5)	0.432
Caregiving >4 hours/day	39 (97.5)	38 (95.0)	1.000
Female patients	22 (55.0)	25 (62.5)	0.650
Orthopedic diseases	21 (52.5)	18 (45.0)	0.655
Neurological/cerebrovascular diseases	9 (22.5)	8 (20.0)	1.000
Hypertension comorbidities	29 (72.5)	24 (60.0)	0.344

Source: Research data, 2025.

Table 2 – Knowledge and preventive practice scores before and after intervention. Health Region 4, Thailand, 2025 (n=80 dyads)

Variables	Groups	Pre-test M (SD)	Post-test M (SD)	t	p
Knowledge	Experimental	5.00 (3.51)	12.13 (1.84)	11.93	<0.001
Knowledge	Control	5.18 (3.45)	10.88 (2.16)	10.40	<0.001
Preventive practices	Experimental	11.60 (5.96)	28.40 (5.84)	13.98	<0.001
Preventive practices	Control	12.35 (4.90)	25.45 (6.94)	10.64	<0.001

Source: Research data, 2025.

Table 3 – Post-test knowledge and preventive practice scores between the groups. Health Region 4, Thailand, 2025 (n=80 dyads)

Variables	Experimental Group M (SD)	Control Group M (SD)	t	p
Knowledge	12.13 (1.84)	10.88 (2.16)	2.78	0.007*
Caregiver characteristics	4.00 (0.00)	3.95 (0.32)	1.00	0.320
Risk assessment	3.03 (1.35)	2.80 (1.47)	0.71	0.478
Skin cleaning	7.65 (1.75)	6.70 (1.91)	2.32	0.023*
Nutrition	1.60 (0.78)	1.45 (0.88)	0.81	0.420
Positioning	5.30 (1.11)	5.20 (1.65)	0.32	0.752
Device use	5.15 (1.39)	4.68 (1.62)	1.41	0.163
Total preventive practices	28.40 (5.84)	25.45 (6.94)	2.06	0.043*

Note: *p<0.05.

Source: Research data, 2025.

DISCUSSION

Improvement in knowledge

The Experimental Group caregivers had significantly higher post-test knowledge scores than those from the Control Group. This finding indicates that a structured educational system using multiple media and repeated review may be more effective than routine education alone. Pressure injury prevention involves several domains, including risk assessment, skin inspection, repositioning, hygiene and moisture control, nutrition and use of pressure-redistributing devices⁽⁴⁻⁵⁾. A digital media-assisted caregiver support system can support learning by allowing caregivers to review content when questions arise during actual care. This finding is consistent with diverse evidence that education for patients and lay caregivers improves knowledge and participation in pressure injury prevention⁽⁸⁻⁹⁾ and with studies showing that caregivers oftentimes have limited baseline knowledge and benefit from structured training⁽¹¹⁻¹³⁾.

Preventive practices

The Experimental Group had a significantly higher total preventive practice score, and the skin cleaning domain showed a significant difference. Skin cleaning and moisture control are routine activities that caregivers can perform in a direct way. Clear instructions and demonstration media may help them improve practices such as observing redness, cleansing skin gently, providing care after elimination and reducing prolonged moisture exposure. Other domains such as Nutrition, Positioning and Device use presented higher mean scores in the Experimental Group but were not statistically significant. These practices may depend on the patients' condition, equipment availability, family resources, the home environment and continuing support from health professionals.

Pressure injury incidence

Pressure injury incidence was lower in the Experimental Group, but the difference was not statistically significant.

This finding should be interpreted with caution. Pressure injury incidence is a distal clinical outcome influenced by disease severity, mobility, nutrition, moisture, level of consciousness, hospitalization time and post-discharge care continuity⁽⁴⁻⁷⁾. The number of events was also small, with four cases in the Experimental Group and five in the Control Group, limiting statistical power to detect differences in proportions. The caregiver support and education system is valuable as a behavioral intervention that enhances caregivers' capacity, which represents an important proximal outcome related to Nursing care quality. Nevertheless, reducing pressure injury incidence as a clinical outcome requires a comprehensive and multifactorial approach, including regular risk assessments, skin inspections, repositioning and pressure reduction, moisture control, nutritional support, appropriate use of pressure-relieving devices and continuous follow-up after discharge⁽¹⁹⁻²⁰⁾. Therefore, this program should be integrated with discharge planning and hospital-to-home transitional care to improve assistance quality for dependent older adults and reduce the long-term risk of pressure injury⁽²¹⁾.

In this study, the follow-up period for pressure injury incidence was one week after the patients returned to their homes. This relatively short period may partly explain why the difference in pressure injury incidence between the groups was not statistically significant. Pressure injury development is time-dependent and may require longer exposure to risk before a measurable clinical difference can be detected. In addition, some clinical risk variables that could influence pressure injury incidence (such as Body Mass Index, nutritional status, incontinence, use of medical devices and detailed duration of immobility) were not systematically collected. These factors should be considered in interpreting the incidence findings.

Limitations

This study did present limitations. Its quasi-experimental design may not fully control all confounding variables, although matching and baseline comparisons were applied. The follow-up period may have been too brief to detect meaningful differences in pressure injury

incidence. The intervention relied on digital technology, which may limit generalizability to caregivers with low digital literacy or limited access to devices. The evidence on technology-based caregiver interventions suggests that digital support may reduce caregiver burden and stress in the short term, but long-term sustainability may depend on intervention design, professional support and caregiver digital literacy⁽²²⁾. The small number of pressure injury events reduced statistical power for incidence comparisons.

Another limitation was the fact that the intervention used digital media and communication channels rather than a full standalone mobile app; therefore, detailed usage analytics such as login frequency, use duration, video viewing time and message response rates were not systematically collected. Approximately 80% of the caregivers were able to use basic digital functions, but some still required guidance, which may affect implementation in settings with lower digital literacy. Furthermore, some clinical risk variables such as Body Mass Index, nutritional status, incontinence and use of medical devices were not fully collected and could therefore not be included in the analysis.

Implications for Nursing practice and research

Hospitals and community health services should consider integrating digital media-assisted caregiver support into discharge preparation for caregivers of dependent older adults at high risk for pressure injuries. Nurses should assess caregivers' readiness early in time and provide follow-up after discharge. Transitional care evidence emphasizes that caregiver involvement, needs assessment, information provision, self-management support and follow-up are central components of successful hospital-to-home care⁽²¹⁾.

Future studies should resort to larger samples, longer follow-up periods and more detailed clinical risk variables, including Braden subscale scores, nutritional status, comorbidities and duration of immobility. Qualitative studies may also clarify caregivers' and nurses' experiences, barriers and facilitating factors in using digital support systems.

From an implementation perspective, the intervention may be feasible for hospitals and community health services

because it uses commonly available digital media and communication platforms rather than a complex standalone app. However, future studies should assess cost-effectiveness, nurse workload related to consultations and feedback, long-term caregiver adherence and scalability across different hospital and community settings.

CONCLUSION

The digital media-assisted caregiver support and education system significantly improved caregivers' knowledge and pressure injury preventive practices in the case of dependent older adults. The strongest practice improvement was observed in skin cleaning. Pressure injury incidence was lower in the Experimental Group, but the difference was not statistically significant. The intervention contributes to the Nursing practice by providing a feasible digital approach to strengthen caregivers' capacity during hospital-to-home transitional care. Future studies with longer follow-up and larger samples are required to verify its effect on pressure injury incidence.

CONFLICT OF INTERESTS

The authors have declared that there is no conflict of interests.

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USE OF ARTIFICIAL INTELLIGENCE TOOLS

Artificial Intelligence tools were solely used to support English language editing, journal-format adaptation and consistency checking. The authors have reviewed, corrected and approved all content and are responsible for the integrity, originality and accuracy of the manuscript.

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Data interpretation: Chumjinda U, Charoenbhakdi J.

All authors are responsible for writing of the article and critical review of the intellectual content, the final version published and all ethical, legal and scientific aspects related to accuracy and integrity of the study.



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