

Cofinanciado por:



UNIÃO EUROPEIA  
Fundo Europeu  
de Desenvolvimento Regional

Project ID:	<b>POCI-01-0247-FEDER-039869</b>
Project Title:	<b>4NoPressure:</b> Development of smart clothing for pressure ulcer prevention
Main Goal:	Strengthening research, technological development, and innovation
Intervention Region:	North, Center
Participating Organizations:	<b>IMPETUS</b> Portugal – Textile, S. A. (leader) <b>ESENC</b> – Nursing School of Coimbra <b>UM</b> – University of Minho <b>INL</b> – Iberian Institute of Nanotechnology

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Approval Date:	07-01-2020	Start Date:	01-06-2020	End Date:	30-06-2023
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Total Eligible Costs:	1.365.857,24 EUR	Co-fund from the European Union   FEDER:	925.558,02 EUR
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### Project Summary:

The 4NoPressure project proposes the development of a new type of smart clothing for bedridden patients or patients with severe motor disability in hospital and home settings to 1) reduce the occurrence of PUs through prevention and therapeutic action, 2) prevent the occurrence of infections resulting from PUs, 3) monitor the clinical condition of patients at high risk of developing PUs in hospital settings, and 4) improve the quality of life of patients with PUs.

The proposed solution presents a new concept of structural and design system for greater ergonomic comfort, considering the patients' reduced mobility, type of movement, and clinical care delivery. New materials and architectures will be explored at the interface fibrous system level to provide greater pressure relief and thermo-physiological control of the skin microclimate.

New materials will be explored to control infection and generate long-lasting antimicrobial protection. The research on this technology and the fibrous system will aim at the release of emollient substances that hydrate patients' skin. For monitoring patients' clinical conditions, the project aims to research an integrated solution and clothing with sensors that monitor and detect critical areas of PU development.

### Scientific Articles

Gomes, F., Furtado, G. E., Henriques, M., Sousa, L. B., Santos-Costa, P., Bernardes, R., Apóstolo, J., Parreira, P., & Salgueiro-Oliveira, A. (2022). **The skin microbiome of infected pressure ulcers: A review and implications for health professionals.** *European Journal of Clinical Investigation*, 52(1). <https://doi.org/10.1111/eci.13688>

Rêgo, A. S., Filipe, L., Dias, R. A., Alves, F. S., Queiroz, J., Ainla, A., Arruda, L. M., Figueiro, R., Bouçanova, M., Bernardes, R. A., De Sousa, L. B., Santos-Costa, P., Apóstolo, J. A., Parreira, P., & Salgueiro-Oliveira, A. (2023). **End-user assessment of an innovative clothing-based sensor developed for pressure injury prevention: A mixed-method study.** *International Journal of Environmental Research and Public Health*, 20(5), 4039. <https://doi.org/10.3390/ijerph20054039>

Rêgo, A.d.S.; Furtado, G.E.; Bernardes, R.A.; Santos-Costa, P.; Dias, R.A.; Alves, F.S.; Ainla, A.; Arruda, L.M.; Moreira, I.P.; Bessa, J.; Figueiro, R.; Gomes, F.; Henriques, M.; Sousa-Silva, M.; Pinto, A.C.; Bouçanova, M.; Sousa, V.I.F.; Tavares, C.J.; Barboza, R.; Carvalho, M.; Filipe, L.; Sousa, L.B.; Apóstolo, J.A.; Parreira, P. & Salgueiro-Oliveira, A. (2023).



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**Development of Smart Clothing to Prevent Pressure Injuries in Bedridden Persons and/or with Severely Impaired Mobility: 4NoPressure Research Protocol.** Healthcare 2023, 11, 1361. <https://doi.org/10.3390/healthcare11101361>

### Oral Communications/Presentations

Costa, B., Furtado, G.E., Brito, R., Apóstolo, J. & Oliveira, A. (2021). **Identificação de parâmetros clínicos para o desenvolvimento de vestuário inovador para prevenção das úlceras de pressão: uma revisão de literatura** [Identification of clinical parameters for the development of innovative clothing for the prevention of pressure ulcers: a literature review] [comunicação oral]. VI Congresso de Investigação em Enfermagem Ibero-americano e de Países de Língua Oficial Portuguesa e II Simpósio Internacional de Cuidados de Saúde Baseados na Evidência, Coimbra, Portugal

Brito, R., Furtado, G.E., Costa, B., Parreira, P. & Oliveira, A. (2021). **Características a atender no desenvolvimento de vestuário inovador para a prevenção de úlceras de pressão: perspetiva do cuidador informal** [Characteristics to be taken into account in the development of innovative clothing for the prevention of pressure ulcers: perspective of the informal caregiver] [comunicação oral]. VI Congresso de Investigação em Enfermagem Ibero-americano e de Países de Língua Oficial Portuguesa e II Simpósio Internacional de Cuidados de Saúde Baseados na Evidência, Coimbra, Portugal

Furtado, G.E., Costa, B., Brito, R., Bernardes, R. & Parreira, P. (2021). **Estudo preliminar para a identificação de parâmetros clínicos associados ao desenvolvimento de um vestuário inovador para prevenção de úlceras de pressão** [Preliminary study to identify clinical parameters associated with the development of innovative clothing to prevent pressure ulcers] [comunicação oral]. VI Congresso de Investigação em Enfermagem Ibero-americano e de Países de Língua Oficial Portuguesa e II Simpósio Internacional de Cuidados de Saúde Baseados na Evidência, Coimbra, Portugal

Rêgo, A., Almeida, T., Filipe, L., Sousa, L.B., Apóstolo, J., Parreira, P. & Oliveira, A. (2022). **VESTUÁRIO INTELIGENTE PARA PREVENÇÃO DE LESÕES POR PRESSÃO EM IDOSOS: PERCEÇÃO DE ENFERMEIROS** [SMART CLOTHING FOR PREVENTION OF PRESSURE INJURIES IN THE ELDERLY: PERCEPTION OF NURSES] [comunicação oral]. II Colóquio Internacional de Envelhecimento, Saúde e Cidadania, Coimbra, Portugal

Rêgo, A., Leão, S., Ramos, B., Filipe, L., Parreira, P. & Oliveira, A. (2023). **PERCEÇÃO DE ENFERMEIROS SOBRE O USO DE VESTUÁRIO INTELIGENTE E A CAPACIDADE PARA O TRABALHO: PROJETO 4NOPRESSURE** [Perception of nurses about the use of smart clothing and work capacity: 4NOPRESSURE PROJECT] [Comunicação oral]. 5th INTERNATIONAL CONGRESS OF OCCUPATIONAL HEALTH NURSING: Workers' Health in the Digital Age, Coimbra, Portugal

### Poster Presentation

Filipe, L., Rêgo, A., S-Costa, P., Sousa, L.B., Bernardes, R., Parreira, P., Apóstolo, J. & Oliveira, A. (2022) **Clothing constraints in maintaining vascular access** [Apresentação de póster]. II International Congress on Vascular Access, Porto, Portugal ( <https://ciav2022.apoava.pt/posters/>)

### Dissemination of the Project at Scientific Events

Presentation of the project at the "International Conference **LEARNING AND IMPLEMENTING SOCIAL INNOVATION**" organized by the Nursing School of Coimbra, AFEdeMy, Shine 2 Europe, and NET4Age-Friendly (2022), Coimbra, Portugal.

### Participation in Science Fairs/Technological Exhibitions

Demonstration of the project at the **Encontros Ciência 2022** event (2022), in Lisbon, Portugal.

Demonstration of the project at the **Technological Exhibition - Health Innovation**, Faculty of Science and Technology of the University of Coimbra (2022). Coimbra, Portugal. <https://www.uc.pt/ucbusiness/inovacao-em-saude/portfolio/#escola-superior-de-enfermagem-de-coimbra>

### Applications for Awards

Submission to the "Good Practices Award for Active and Healthy Ageing in the Central Region 2022", an initiative of the Regional Coordination and Development Commission of the Center (CCDRC) in collaboration with the Ageing@Coimbra and AgeINfuture consortia.

Updated in May 2023

