

Association of quality of life with performance status, circadian rhythm, and activity level of lung cancer patients using wearable devices as ambulatory monitoring

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Introduction

Lung cancer survivorship has two critical attributes: survival time or quantity and quality of life (QoL).¹ After decades of efforts focusing on reducing lung cancer incidence and mortality, we are now challenged by the lack of understanding of the health conditions and QoL among people who survived lung cancer.² Herein, we report on the first integration of clinical data, wearable devices and QoL questionnaires in order to determine the factors that predict poor health status and to design personalised interventions that will improve patients' QoL, based on clinical and real-world data.³⁻⁵

Methods

Patients diagnosed and treated at the medical oncology department at Puerta de Hierro University Hospital were included. Eligible patients were aged >18 years old, were diagnosed with non-small-cell lung cancer (all stages) and had an Eastern Cooperative Oncology Group score 0–1. Artificial intelligence (AI) and knowledge discovery (KD) techniques were used to integrate heterogeneous datasets and synthesise complex relationships within these large data sets. A watch-like wearable device (Kronowise 3.0, Kronohealth, Espinardo, Spain) was placed on a patient's wrist for a whole week, registering temperature, physical activity and light exposure for 24 hours a day. Written informed consent was obtained from all patients prior to the initiation of the study. The European Organisation for Research and Treatment of Cancer (EORTC) core quality of life questionnaire (EORTC QLQ-C30), designed to measure cancer patients' physical, psychological and social functions, was completed by all patients.

Results and discussion

A total of 140 patients were included in the study: 32 were diagnosed with localised disease (IA–IIIB), and 98 with advanced stage IIIC/IV receiving different treatments (radiotherapy, chemotherapy, immunotherapy, chemotherapy plus immunotherapy and tyrosine

Table 1. Patients and classified by treatment

Stage	Treatment	n=130
Localised, n=32	CHT	8
	IO	4
	CHT/IO	2
	Follow-up	18
Advanced, n=98	RT	2
	CHT	25
	IO	35
	CHT/IO	10
	TKI	18
	Follow-up	8

CHT = chemotherapy; IO = immunotherapy; RT = radiotherapy; TKI = tyrosine-kinase inhibitors.

kinase inhibitors; Table 1). Results from QoL questionnaires showed that pain, dyspnoea and insomnia were the most common symptoms reported by lung cancer patients. Sixty-three per cent of patients reported mobility issues and 53% suffered from anxiety and depression. These results match the objective monitoring obtained from the wearable device, which showed sleeping disorders in 68% and lack of physical activity in 54% of patients, compared with healthy population parameters. Preliminary results suggest that wearable devices and QoL questionnaires are useful in detecting sleep disorders, inactivity and other factors that could influence the QoL during and after lung cancer treatment.

Conclusion

Design and validation of the effect of multidisciplinary interventions based on clinical and real-world data from the patients will ensure a personalised follow-up with a better assessment of their needs and eventually improve their quality of life, wellbeing and outcome. ■

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References

- 1 Provencio M, Romero N, Tabernero J *et al*. Future care for long-term cancer survivors: towards a new model. *Clin Transl Oncol* 2022;24:350–62.
- 2 Yang P. Epidemiology of lung cancer prognosis: quantity and quality of life. *Methods Mol Biol* 2009;471:469–86.
- 3 Heuvers ME, Hegmans JP, Stricker BH *et al*. Improving lung cancer survival; time to move on. *BMC Pulm Med* 2012;12:77.
- 4 Chang WP, Lin CC. Changes in the sleep–wake rhythm, sleep quality, mood, and quality of life of patients receiving treatment for lung cancer: A longitudinal study. *Chronobiol Int* 2017;34:451–61.
- 5 Almada-Pagan PF, Torrente M, Campos M *et al*. Chronodisruption and ambulatory circadian monitoring in cancer patients: beyond the body clock. *Curr Oncol Rep* 2022;24:135–49.