Assessing the Impact of a Wearable Device on the Early Detection of COPD Exacerbations: A Retrospective Cohort Study

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BACKGROUND

Chronic Obstructive Pulmonary Disease (COPD) is a leading global cause of mortality (1), affecting an estimated 64 million individuals worldwide (2). Exacerbations of COPD, marked by worsening respiratory symptoms are often triggered by infections, environmental factors, or air pollution (1). Exacerbations can lead to hospitalisation, increased mortality risk, and long-term health deterioration (3). Exacerbations serve as indicators of disease progression and are associated with significant economic burdens on healthcare systems (4). A study examining the economic impact of COPD revealed that emergency admissions and hospitalisations constitute the majority (72.8%) of the overall cost of treating the condition, with prescription medications accounting for only 12.2% (5). Recognising the importance of early intervention, particularly in acute exacerbations of COPD (AECOPD), is crucial for mitigating disease burden and reducing hospitalisation rates (5). It is known that physiological signals change before and during a COPD exacerbation (6 - 8). Therefore, in this study, we explored the potential for early detection using a wearable device, which may allow timely community intervention to minimise hospitalisation, reduce global healthcare burden, and decrease disease morbidity and mortality.

OBJECTIVES

Primary

- How soon (or if at all) the wearable device can accurately identify when the clinical health of a COPD sufferer is starting to deteriorate.

Secondary

- Usability of wearable device within primary care setting.
- Exploring whether the device can determine disease severity in individual volunteers.
- To assess the usability and comfort of wearable technologies in primary care settings assessed by qualitative interviews.
- Exploring whether the wearable device can identify the daily disease burden of COPD on individual volunteers, allowing better disease stratification/appropriate therapy.

METHODOLOGY

- 30 volunteers with COPD, mMRC Grades 1-4 who have been hospitalised due to acute exacerbations within the past year.
- Data collection will last up to 18 months.
- Focus on physiological changes occurring 168 hours prior to any subsequent hospitalisation due to a COPD exacerbation.
- Volunteers will complete a 10-minute symptom questionnaire every fortnight.

Frontier X2

- World's first chest-worn Smart Heart Monitor
- Heart Rate
- Breathing Rate
- Heart Rate Variability (HRV)
- Continuous ECG monitor
- Continuous real-time monitoring
- Vibration alerts
- Waterproof up to 1.5 meters
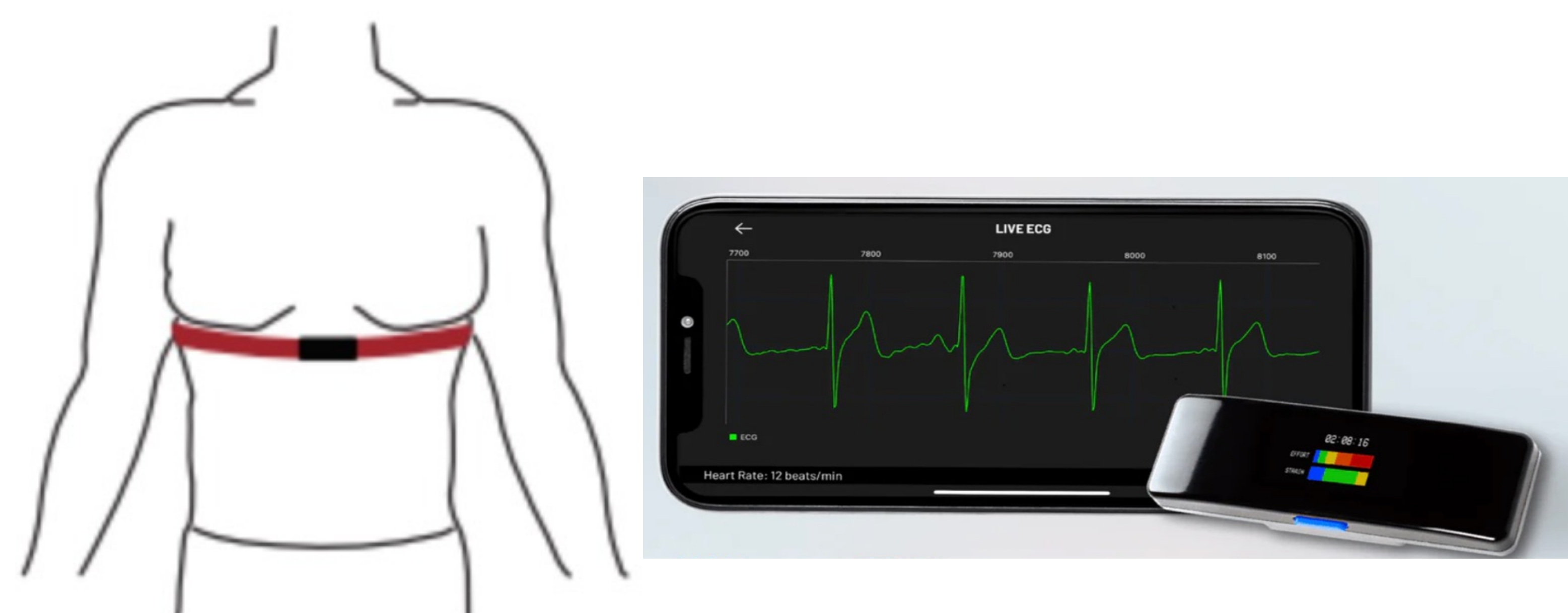- IEC, ISO, REACH, CE, and RoHS
- 24 hours battery

Figure 1. Image of Frontier X2 wearable and associated mobile app. Direct reproduction from Fourth Frontier Technologies Ltd (https://uk.fourthfrontier.com/, accessed on September 2024 n.d.).

RESULTS

Preliminary trial data indicates that the wearable device has the clinical potential to detect physiological changes suggestive of impending COPD exacerbation. Initial volunteer feedback highlights high usability and acceptance, bolstering the possibility of routinely adopting these devices within primary care settings.
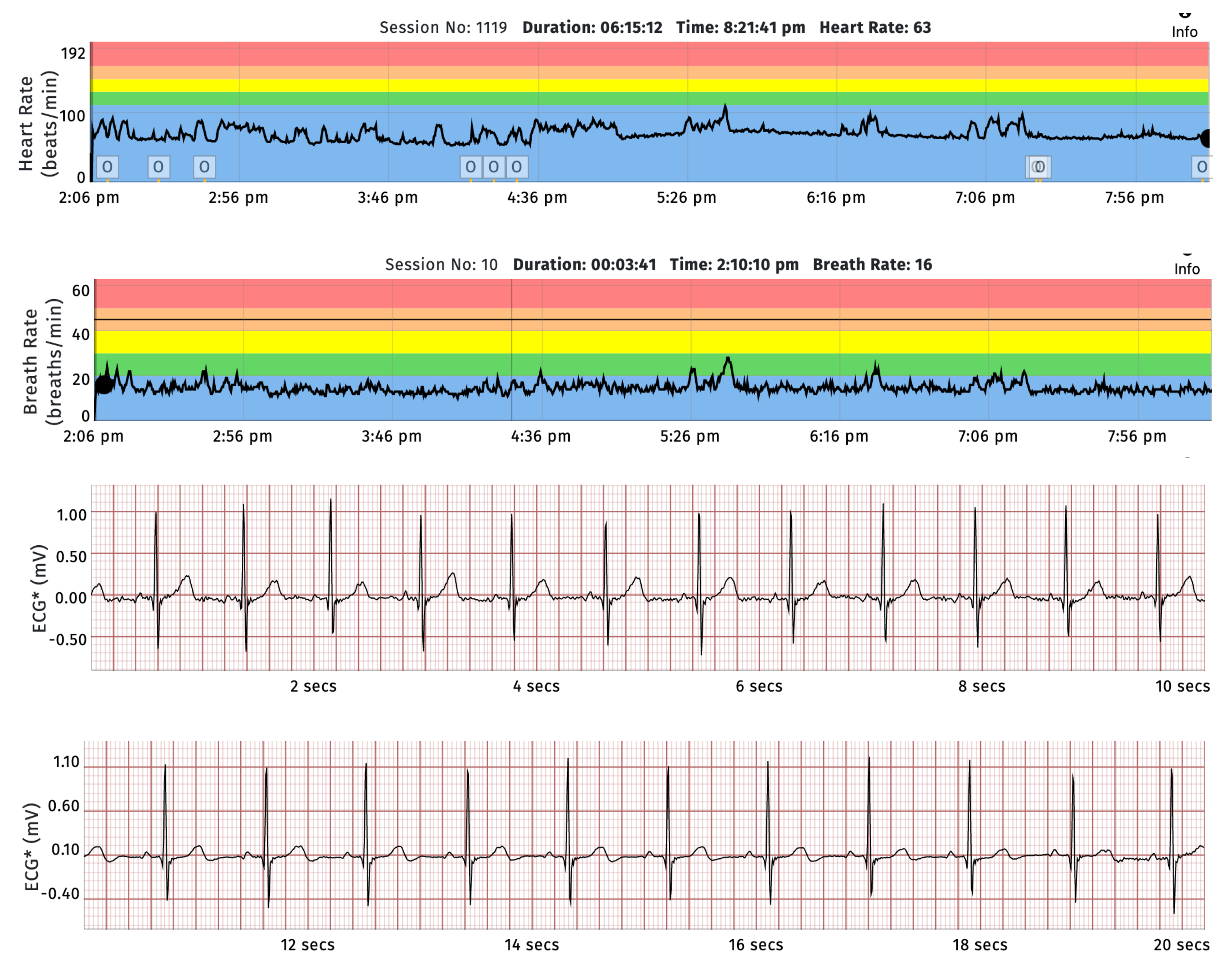
Figure 2. Heart rate, breath rate, and ECG signals from the Frontier X2 were collected on the Fourth Frontier dashboard.

CONCLUSION

There is clinical potential for the Frontier x2 device to have sufficient sensitivity to detect early stages of COPD exacerbation. This device could support prompt clinical intervention, potentially lowering hospital admissions and improving outcomes. Adopting these technologies has the potential to transform COPD management by emphasising proactive care over reactive treatment, ultimately enhancing clinical outcomes and disease mortality and morbidity.

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