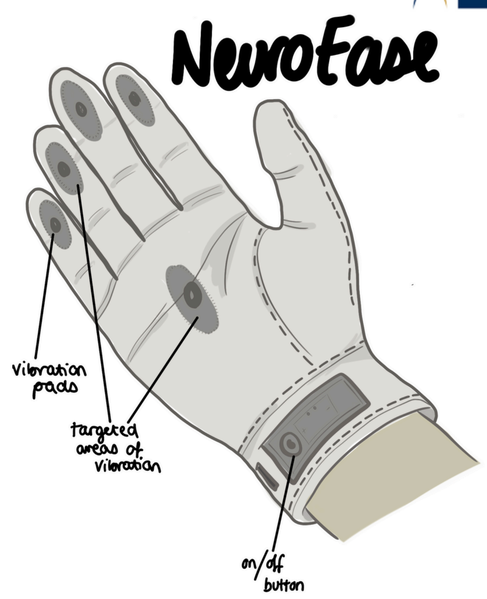
NEUROEASE



Cancer is the second largest cause of death globally, and can be treated with chemotherapy. Nearly 25% of cancer patients receive chemotherapy during a year, and it is said that it can double the survival rate for some pleural mesothelioma cancers. Unfortunately, many patients suffer detrimental side effects from the various drugs used, leading to a poor quality of life.

Authors

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CHEMOTHERAPY

Chemotherapy is a pharmacological treatment that uses potent chemicals to kill rapidly growing somatic cells. It is commonly used to treat cancer, a disease caused by malignant tumours.

As part of chemotherapy, different drugs, such as platins and alkylating agents can be utilised. Their mechanism of impairing cells during cell division and disrupting semi conservative replication in the S phase of interphase can be vital in treating cancer.

A more advanced understanding of chemotherapy is to employ cytotoxic agents to inhibit cell proliferation and tumour growth in order to limit invasion and metastasis. Traditional chemotherapy agents affect macromolecular synthesis and neoplastic cells by interfering with DNA, RNA and protein synthesis. Thus, this severely hinders the function of neoplastic cells that contribute to cancer.

However, as chemotherapy is not selectively toxic to cancerous cells, its potency can be harmful on normal somatic cells. This may lead to detrimental external and internal systemic side effects on the patient, like fatigue, hair loss and nausea. Therefore, the decision to administer chemotherapy must be addressed with careful consideration, discussing potential risks and benefits imposed on the patient.

CIPN

Chemotherapy induced peripheral nerve damage (CIPN) is a common side effect of chemotherapy. Around 30% to 60% of patients will be affected by this condition, where the severity ranges from acute to chronic. Acute CIPN Occurs shortly after a round of chemotherapy, often self-limiting patients to experience unpleasant sensations. However, chronic CIPN is cumulative and persists for at least three months after the chemotherapy treatment ends.

CIPN spreads proximally to affect limbs, leading to sensory, motor and autonomic dysfunction. The primary characteristics of this condition are numbness, tingling and inflammation.

MECHANISMS CAUSING CIPN

Microtubule dysfunction
- A key component of the cytoskeleton which aids the transport of axons, so any complications that arise lead to peripheral neuropathy

Mitochondrial damage
- Leads to breakdown of double membrane
- Oxidative stress mechanism leads to cell damage

Dysfunction of sodium ion channels
- An imbalance of NCX as a biochemical channel transporter can lead to an accumulation of toxic Ca2+ ions, leading to neuronal damage

Neuroinflammation
- Chemotherapy drugs that cause CIPD trigger the release of cytokines

HOW DOES NEUROEASE WORK?

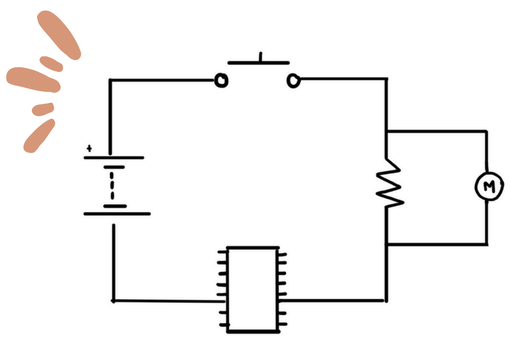
When the vibration pads on the gloves are switched on, it can activate sensory neurones present in areas of the body affected by CIPN. This stimulates muscles to contract and relax more rapidly, increasing blood circulation (through increasing vasodilation) and the rate of oxygen delivery to muscles. These vibrations would be of a low frequency in order to reduce the level of cytokines, signalling hormones that stimulate inflammation.

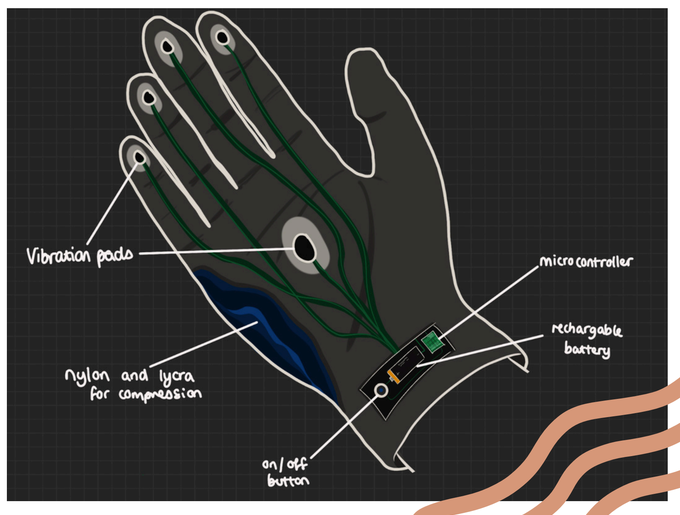
Another one of the symptoms of CIPN is cold sensitivity, which is a side effect of chemotherapy drugs like Oxaplatin. This reduces metabolism and can contribute the symptoms of fatigue in the chemotherapy patients. Cold sensitivity is caused by damage to the myelin sheath on neurones, which typically act as thermal insulation. Neuropath is made out of fleece, which acts as an effective insulator to reduce heat loss by conduction or convection.

Resistance is needed enforce active rehabilitation, so we incorporated nylon and lycra for compression when the patient moves their hands. This aids the recovery of motor neurones in order to reobtain strength in hand muscles. A key aim of NeuroEase is to improve neuroplasticity, a process involving adaptable strucutral and functional changes to the brain. This enables the patient to adapt to life with cancer as the brain can compensate for damaged nerves.

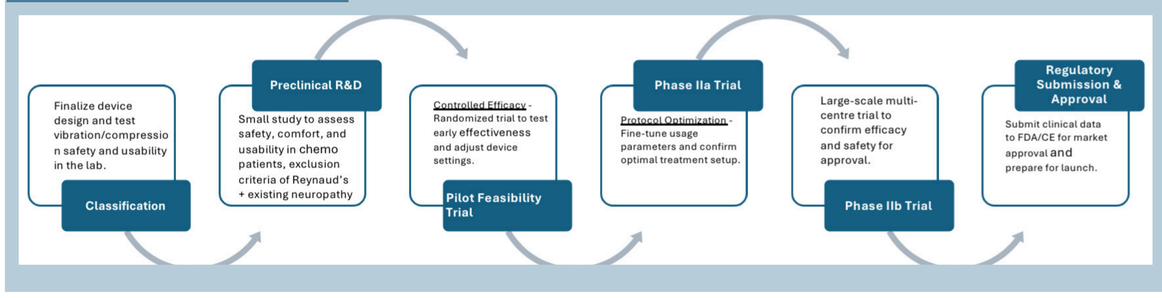
NEUROEASE

NeuroEase is a wearable therapeutic device designed to help prevent and reduce chemotherapy induced peripheral neuropathy, a painful side effect of chemotherapy that causes numbness, tingling and weakness of the limbs. Neuroease is practical and sustainable article of clothing that utilises a rechargeable battery to power the glove. Providing better coverage than smaller devices, the nails are covered to combat nail discolouration, a consistent consequence of chemotherapy.





CLINICAL TRIALS



The main objective of our clinical trials is to test the safety and efficiency of our NeuroEase wearable glove in reliving symptoms of CIPN. Our inclusion criteria includes cancer patients diagnosed with hard tremors and have reported neuropathy symptoms while undergoing chemotherapy .After approval, NeuroEase will move into production and clinical rollout, with training for oncology staff and distribution to cancer treatment centres. Post-market surveillance will monitor safety and effectiveness in real-world use, while feedback from patients in questionnaires examining the comfort of the glove and clinicians may guide future improvements or expanded applications.

REFERENCES

USER EXPERIENCE

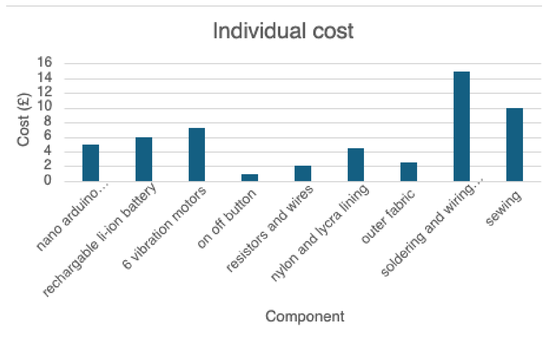
The NeuroEase glove is designed for easy, consistent daily use to fit seamlessly into the routines of patients managing chemotherapy-induced peripheral neuropathy. Users will wear the glove at home for a prescribed duration each day—typically ranging from 30 to 60 minutes—depending on individualized treatment parameters determined during clinical development. The glove delivers a combination of acupressure, gentle vibration, and controlled compression, all calibrated to therapeutic levels that are both comfortable and effective. Patients can simply slip the glove on, activate it with a button or through an accompanying app, and continue light activities such as reading or watching television during treatment sessions. The intuitive design ensures ease of use, even for those with limited hand dexterity. By integrating NeuroEase into a daily self-care routine, users can engage in proactive symptom management with minimal disruption to their lifestyle, while also tracking progress and comfort levels through built-in feedback mechanisms or a digital interface.

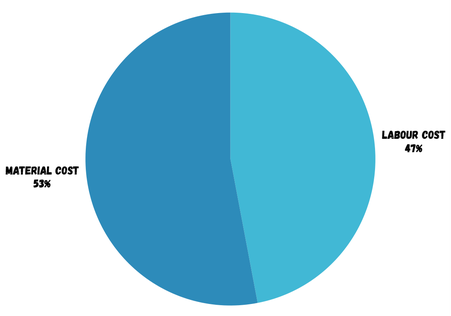
ETHICS

When used for a prolonged period of time without any breaks, overheating, excessive vibration and pressure could cause skin damage or burns. To mitigate this the product could be linked with a software that can regulate the responses based on the patient's current condition. Also patients must be fully aware that this is an adjunct device and not a replacement for a medical treatment, there needs to be clear labelling mentioning that this device does not cure CIPN, but rather reduces its effects. Furthermore, when launched, the glove could be limited to only wealthier patients or hospitals due to a lack of funding and resources in healthcare settings in more deprived areas, this causes medical inequity. While rechargeable batteries are a step in the right direction, when damaged the disposal of the glove could exacerbate the growing e-waste problem. Finally, the device may not work equally well for all users, and unmet expectations could lead to disappointment or psychological distress in some patients.

FEASIBILITY

The main challenge to overcome aside from the funding itself, which can be derived from NHR (National institute for health and care research) is the ability of this product to be scaled to a NHS level at an affordable rate.
The technology required—wearable vibration motors and controlled compression—is readily available and adaptable into a comfortable, patient-friendly glove format. Additionally, the intervention is non-invasive, easy to integrate during chemotherapy infusions, and has the potential for high compliance. Early-stage testing can be conducted safely, and a clear regulatory pathway exists through the FDA's De Novo or 510(k) routes for therapeutic devices. Collectively, these factors suggest that NeuroEase is both technically and clinically feasible for development and eventual use in oncology care.





PROS AND CONS

PROS	CONS
Easy to use, so the scope of patients that can be prescribed the glove is not limited.	Possible limited ability to use your hand during treatment. Thus, may affects patient's dexterity.
Production cost would be low – potential for batch/mass production in the long run.	Prolonged or repetitive vibration may displease patients daily which may overtime deter patient from being open to using it.
Ability for patient to freely control what mode goes first.	Some may find the material bulky or discomforting if worn for lengthy periods of time, which could lead to skin sensitivity issues.
Feeling of fatigue significantly reduced as higher rate of aerobic respiration leads to more sustained energy availability (to aerobically respiring cells) and metabolic activity.	Someone may lack the physical strength to push the button, so they are unable to activate it when necessary