Environmental Impact Of Digital Remote Care Versus Standard Care For Chronic Myeloid Leukemia Patients: Pilot Study

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INTRODUCTION

- The Dutch **healthcare sector** is a **big contributor** in terms of **greenhouse gas emissions**, **representing 7%** of the total national emissions[1].
- To address this, our hospital launched a **regional digital remote care initiative** for **Chronic myeloid leukemia** (CML) patients[2].
- CML is a serious but manageable condition with daily oral tyrosine kinase inhibitors (TKIs), allowing normal life expectancy[3].
- **As a lifelong condition**, CML requires continuous, high-quality, and **accessible care**.
- This approach provides hospital-free care through:
  - **Video consultations** for remote medical support.
  - **Local BCR::ABL1 blood collection**, reducing the need for outpatient visits.
- Patients receive equally high-quality care while being monitored and tested closer to home.

Objective

This study aims to assess the environmental impact of digital care compared to standard (in-person) care for chronic myeloid leukemia patients in the Radboudumc.

METHODS

- The study assesses **transport, energy use for video consultations, and sample transport materials**, excluding lab testing.
- **In-person** patients travel to Radboudumc, while **eHealth** patients have **video appointments** and use **local blood** collection sites.
- Transport modeling used Radboudumc data, assuming EURO-4 vehicles with an 80/20 petrol-diesel split[4].
- **Environmental** impact was **analyzed via SimaPro 9.6** with Ecoinvent v3.10, including scenario and sensitivity analyses.
- **Missing data** was estimated using **proxies**, with all waste assumed incinerated.

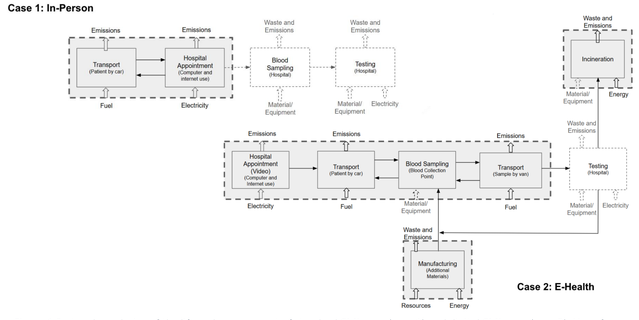

Figure 1 System boundaries of the life cycle assessment of standard CML care (case 1) and digital CML care (case 2). Use of computer and the internet is not included in this figure but is included in the analysis.

RESULTS

- **Preliminary LCA results** show that digital CML care reduces environmental impact compared to in-person care.
  - **Ecosystem damage** decreases by **85.4%** (Figure 2)
  - **Resource use** drops by **85.6%** (Figure 3).
- Despite this shift, **BCR::ABL1 disease values remain comparable** between digital and standard care groups
  - Ensuring equal quality of care.

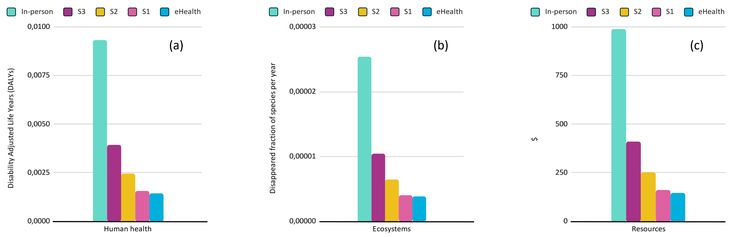

Figure 2. The impacts of each base case and scenario for the three endpoint areas of protection: (a) Human health, (b) Ecosystems, and (c) Resources.

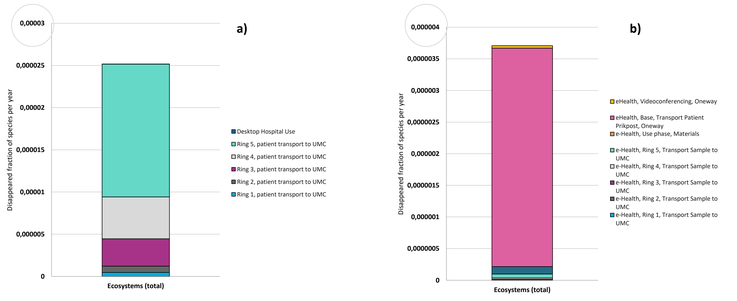

Figure 3 Ecosystem damage (in disappeared species per year) of patients in standard care (a) versus patients using digital (b) CML care.

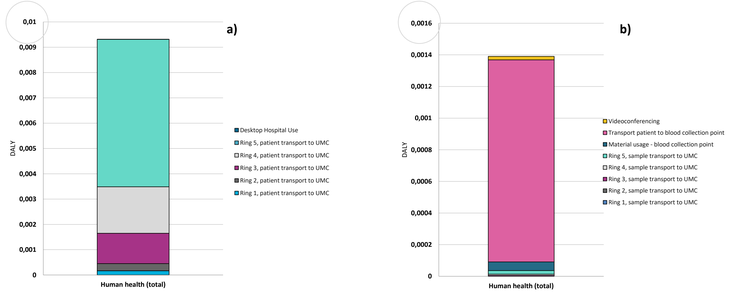

Figure 4 Human Health in DALYs of patients in standard care (a) versus patients using digital (b) CML care.

DISCUSSION

- **Switching all stable CML patients to digital remote care** reduces environmental impact by **85%**, though not all patients will opt in.
- Patients **farther from Radboudumc** are more likely to choose digital care, significantly lowering emissions.
- This reduction equals **6,624 kg CO_2-eq per year**, comparable to driving **24,000 km**—over **half the Earth's circumference**[5].
- **Patient transport** is the largest emissions source, while **sample transport contributes just 2.6–5%**.
- Emissions will **decline with cleaner engine technologies**, including electric and hybrid vehicles in the Netherlands.
- Travel distances were slightly **overestimated**, but even after adjustments, **eHealth still reduces environmental impact by over 75%**.

CONCLUSION

- **Remote digital CML care:**
  - **Is safe**, with BCR::ABL1 values comparable to standard care.
  - **Is more sustainable**, as it reduces travel and resource consumption.
  - **Minimizes environmental impact** while promoting sustainability.
  - **Enhances healthcare efficiency** for long-term management of chronic conditions.

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