



eLi₁₂: A new method to estimate 12-hour lithium levels

Implementation and Health Economics

Ole Köhler-Forsberg¹, Christian L. Kraft², Camilla R. Birch³, Lars H. Ehlers³,
Stephen Faraone⁴, Andrew Nierenberg⁵

The new eLi₁₂ Solution

- We have designed a **new method to estimate 12-hour lithium blood levels** when the lithium blood test is taken at a different time point than 12 hours after the last lithium dose: **eLi₁₂**
- National implementation of eLi₁₂ will result in a Net Monetary Benefit of **14-64 million DKK/year** and a reduction in productivity costs between **19-194 million DKK/year**
- We will **implement eLi₁₂** in Aarhus in 2025 and will plan an implementation study in Copenhagen, Aalborg and several German hospitals for 2026
- eLi₁₂ will become a CE marked medical device that can make lithium blood test timing more flexible.

The clinical need

Lithium is a first-line mood-stabilizing treatment and dosages are based on the clinical effect and lithium blood levels. For >50 years, lithium blood levels should be measured 12 hours after the last lithium dose.

However, we have shown that >75% of lithium blood tests are taken with wrong timing and may be misleading¹. Furthermore, lithium treatment often last years to decades, and we found that 40% of all lithium blood tests were taken in non-specialized GP settings.

The eLi₁₂ Solution

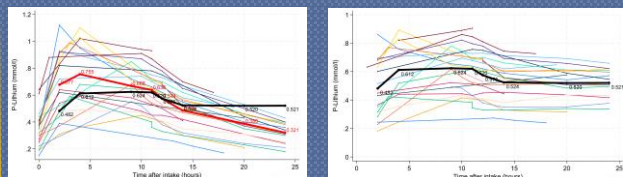
We have developed a new method to estimate 12-hour lithium levels: eLi₁₂.

eLi₁₂ estimates the 12-hour lithium blood concentration independent of when the blood test is taken (e.g. 16 hours after the last lithium dose). The eLi₁₂ concept is based on a discovery trial (N=192) and 2 proof-of-concept trials (N=173) and the findings have just been published².

In the large proof-of-concept study conducted in Aarhus, we took 163 blood tests during 24 hours after the last lithium dose. Fig. 1 presents the measured serum lithium levels over 24 hours after the last lithium dose (red line in left graph) and eLi₁₂ (black line in left and right graph).

The mean deviation from the 12-hour level was 10% for eLi₁₂ compared to 25% for the measured se-Li level (p<0.001). Among 102 blood tests taken between 3 and 24 hours after the last lithium dose, eLi₁₂ was closer to the 12-hour level compared to the serum lithium level in 99 out of 102 blood tests.

Fig. 1: Lithium levels and eLi₁₂ levels during 24 hours after the last lithium dose in 23 patients on a stable dose.



References:

- ¹ Jacobsen S, Kraft CL, Devantier TA, Köhler-Forsberg O. *medRxiv*, <https://doi.org/10.1101/2024.10.17.24318010>.
- ² Köhler-Forsberg et al. *J Clin Psychiatry*, March 03, 2025
- ³ Birch C, Kraft C, Köhler-Forsberg O, Ehlers L. *Value in Health*, December 2024, Vol 27, Issue 12, Supplement 128

Implementation

We have designed a prototype for Central Denmark Region and prepared all necessary steps to **implement the eLi₁₂ solution in Aarhus**, which will be tested in an implementation study during 2025-2026.

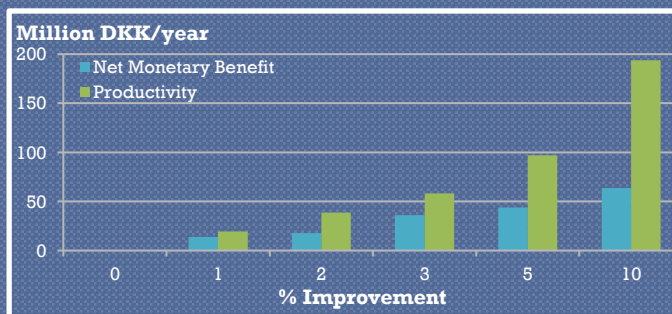
We are planning an **international multi-site implementation study** in Copenhagen, Aalborg and several German University Hospitals.

eLi₁₂ is **patented and will receive CE marking in 2026**, whereafter it is possible to implement eLi₁₂ in any clinical setting as a software medical device.

Early Health Economic Assessment

- We performed economic analyses based on 28,000 patients with bipolar disorder in Denmark in 2023, whereof 34% are treated with lithium. To estimate the Net Monetary Benefit, we modelled potential improvements of lithium treatment on hospitalizations, lithium intoxications, suicide, mood episodes, and productivity.
- **Implementation of eLi₁₂ can result in a Net Monetary Benefit between 14-64 million DKK/year and reduce productivity costs by 19-194 million DKK/year (1-10% improvement of lithium treatment, Fig. 2)³.**

Fig. 2: Net Monetary Benefit (blue, monetary value of health benefits plus the net savings) and **reduction in Productivity costs** (green, related to bipolar disorder due to improved lithium treatment with eLi₁₂) of implementing eLi₁₂ in Denmark.



Affiliations:

- ¹ Psychosis Research Unit, Aarhus University Hospital Psychiatry
- ² Department of Affective disorders, Aarhus University Hospital Psychiatry
- ³ Nordic Institute of Health Economics (NIHE), Aarhus, Denmark
- ⁴ SUNY, New York, USA
- ⁵ Massachusetts General Hospital, Boston, USA