Cystic Fibrosis Research News

Title:

Cystic Fibrosis Newborn Screening in Switzerland – Evaluation and scenarios for improvement after 11 years of follow-up

Lay Title:

11-year evaluation of newborn screening for Cystic Fibrosis in Switzerland

Authors:

Pedersen ESL[1], de Jong Carmen CM[2], Jurca M[1,3], Berger DO[1], Sanz J[4], Sluka SHM[5], Poms M[6], Baumgartner MR[6], Regamey N[7], Kuehni CE[1, 2], Barben J[8]*, Rueegg CS[9]*; for the Swiss Cystic Fibrosis Newborn Screening Group[#]

Affiliations:

1. Institute of Social and Preventive Medicine, University of Bern, Bern, Switzerland
2. Division of Paediatric Respiratory Medicine and Allergy, Department of Paediatrics, University Children's Hospital Bern, Bern, Switzerland
3. University Children's Hospital Basel, Basel, Switzerland
4. Department of Human Genetics, Inselspital, University Hospital Bern, Bern, Switzerland
5. Newborn Screening Switzerland, University Children's Hospital Zurich, University of Zurich, Zurich, Switzerland
6. Division of Metabolism and Swiss Newborn Screening, University Children's Hospital, Zürich, University of Zurich, Switzerland
7. Division of Paediatric Pulmonology, Children's Hospital Lucerne, Lucerne, Switzerland & Medical Faculty, University of Bern, Bern, Switzerland
8. Paediatric Pulmonology & CF Centre, Children's Hospital of Eastern Switzerland, St. Gallen, Switzerland
9. Oslo Centre for Biostatistics and Epidemiology, Oslo University Hospital, Oslo, Norway

* Equally shared last authorship

What was your research question?

We aimed to answer the following questions:

- How effective was the Swiss Cystic Fibrosis newborn screening program in identifying children with CF at birth since its introduction in 2011?
- Could changes to the screening procedure improve the effectiveness of the program?

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Why is this important?

Newborn bloodspot screening (NBS) is extremely important in the early detection of CF in many countries. CF-NBS aims to identify and treat infants with CF early to prevent symptoms, improve quality of life, and reduce death. While CF-NBS programs offer significant benefits, they also pose challenges, including the possibility of false-positive results, which can lead to unnecessary stress for families and burden for the healthcare system.

What did you do?

The Swiss CF-NBS involves 3 steps:
1) screening for immunoreactive trypsinogen (IRT) by heel-prick test in the first week of life,
2) genetic testing (18 CF-causing *CFTR* variants) if IRT was elevated, and
3) a second IRT measurement if no variants are detected; this is called the safety net.

We evaluated effectiveness of the CF-NBS by calculating the sensitivity (detection of children with CF), and positive predictive value (PPV: the probability that a positive screening outcome results in a CF diagnosis).

We simulated different scenarios such as changing IRT cut-offs or removing the safety net and calculated how these changed the effectiveness of the screening.

What did you find?

Between 2011-2021, nearly one million newborns were screened in Switzerland. 1106 children were screened positive, of which 272 received a final CF diagnosis (PPV=25%). The sensitivity was 96%, as 10 children were clinically diagnosed with CF after a negative screening result.
In a simulated scenario without safety net, we could have avoided more than 200 unnecessary second heel-prick-tests per year and improved PPV to 30%, but at the cost of 5 additional children with CF missed. In another scenario with increased IRT cut-offs, we could have increased the PPV to 32% and retained the sensitivity, however, many families would still have been called in for an unnecessary second heel-prick-test.

What does this mean and reasons for caution?

A sensitivity of 96% in the Swiss CF-NBS exceeds the 95% recommended by the European CF Society, but a PPV of 25% is lower than that recommended (30%), indicating the need for improvement in the Swiss CF-NBS procedures.

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The Swiss experience with the CF-NBS provides valuable insights into the complexities of screening processes and the challenges of balancing sensitivity, PPV and burden to families and health care systems. The findings underscore the importance of evidence-based decision-making in shaping NBS policies and practices, with the ultimate goal of improving health outcomes for newborns with CF.

What's next?

Members of the Swiss CF-NBS task force are discussing possible changes to the CF-NBS procedures with the goal to improve PPV and retain sensitivity, based on the current results. Changes to the CF-NBS will be monitored and evaluated closely to ensure their effectiveness and adherence to international standards.

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