

---

## Cost-effectiveness analysis of a system-based approach for managing neonatal jaundice and preventing kernicterus in Ontario

*Xie B, Da Silva O, Zaric G*

---

### Record Status

This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

### CRD summary

The study investigated the cost-effectiveness of a system approach to screening for neonatal jaundice compared with usual care. The authors concluded that a system approach was cost-effective and was economically acceptable in the context of other neonatal medical services. The conclusions are reasonable given the results obtained. However, they cannot be considered robust given the high level of uncertainty in the data.

### Type of economic evaluation

Cost-effectiveness analysis, cost-utility analysis

### Study objective

The aim was to examine the cost-effectiveness of a system approach for managing neonatal jaundice and preventing kernicterus. The study population was a hypothetical cohort of 300,000 term and late preterm neonates ( $\geq 35$  weeks) representing the Canadian birth cohort.

### Interventions

A system approach to screening for neonatal jaundice was compared with usual care. The system approach involved earlier and more comprehensive neonatal bilirubin measurement testing at the maternity in-patient stay. Traditional or usual care involved standard practice for managing the condition with no routine bilirubin testing.

### Location/setting

Canada, secondary care.

### Methods

#### Analytical approach:

A decision-tree model was used to map clinical pathways and synthesise evidence including patient data and case costing from a large teaching hospital in Ontario, Canada, and a selection of relevant published studies. The authors stated that the perspective was that of a Canadian public payer. The time horizon appeared to be lifetime.

#### Effectiveness data:

The authors performed a review of the literature to obtain probabilities for the model parameters such as morbidity from exchange transfusion, high-risk infant visits, proportion of infants tested and emergency room and readmission visits. A selection of relevant studies was used for these parameters together with author assumptions (such as all infants would be tested and followed up according to the schedule). Pre-discharge treatment rates, reduction in hyperbilirubinaemia and the estimated reduction in kernicterus rates were the key clinical inputs. Survival from patients with cerebral palsy were fitted with a Gompertz function and used to approximate life expectancy for the population of neonates.

#### Monetary benefit and utility valuations:

Utilities were extracted from a publication about children with cerebral palsy in the absence of data for patients with kernicterus (see Other Publications of Related Interest).

#### Measure of benefit:

The measures of benefit used were cases of kernicterus prevented, life-years saved and quality-adjusted life years

(QALYs).

#### **Cost data:**

Direct medical costs included bilirubin measurements, phototherapy, exchange transfusions, morbidity costs from exchange transfusions, follow-up visits, lifetime cost of kernicterus and hospital admissions for neonatal jaundice. Resource use was derived from various studies in the literature and London Health Sciences Centre, Ontario patient-level clinical data. Cost values employed unit costs from the 2008 Ontario Health Insurance Plan (see Other Publications of Related Interest). Prices were presented in Canadian dollars (\$) for 2008.

#### **Analysis of uncertainty:**

The model parameters were examined with one-way and multi-way sensitivity analyses on key parameters such as treatment rates of the two strategies, kernicterus rate, reduction rate in kernicterus cases and bilirubin test costs. Sensitivity analyses were presented in tables for selected parameters.

### **Results**

Total costs were \$25,897,000 for the routine care option and \$26,349,000 for the system approach which was an additional \$3 per child under the system approach.

Mean QALYs gained using the system approach was 6.88. Life-years gained was 17.2. Kernicterus cases prevented was 0.8.

Compared to routine care, cost per QALY gained for the system approach was \$65,698, cost per life-year was \$26,279 and the cost per kernicterus case prevented was \$570,496.

Findings from one-way sensitivity analyses when variations to key parameters were applied showed the model was sensitive to the cost of bilirubin measurement, change in treatment rate and baseline kernicterus case rate or reduction rate in the system approach. The base findings were cost-saving to the health payer under a number of values (high treatment rates in the routine care 5% to 6%, low kernicterus rate in routine care one in 27,000 and high kernicterus reduction rates >40%).

#### **Authors' conclusions**

The authors' concluded that a system-based approach to controlling neonatal jaundice was a cost-effective strategy compared with traditional routine care and the cost per QALY gained was well within the range accepted for other screening tests in the perinatal period.

#### **CRD commentary**

##### **Interventions:**

The strategies were not described in detail. The authors provided some details of the key elements of the system-based approach.

##### **Effectiveness/benefits:**

Details of the clinical studies used for the economic model were not justified so it was difficult to assess the quality of the clinical estimates or the thoroughness of the authors' literature review. No details were provided on the estimation and valuation of utilities and why values from children with cerebral palsy were used as proxies. No direct evidence was available for a reduction in kernicterus cases from a system-based approach.

##### **Costs:**

Unit costs were presented clearly. Comparative resource quantities for the strategies were not reported so it was difficult to see what resources were used in the two strategies. Costs were based on publicly available sources.

Total costs and costs per child were presented. Costs per child were divided into costs before discharge, in follow-up visits, emergency room visits, readmission and kernicterus. There was no breakdown of resource use within these per-child costs; this would have aided transparency and generalisability. Overall the reporting of cost data was adequate.

#### **Analysis and results:**

Data were synthesised using a decision-tree model (described in full). The results were reported clearly. The authors highlighted some limitations of their study and included a detailed comparison with a second cost-effectiveness study (Suresh et al., see Other Publications of Related Interest). This comparison raised the issue of high variability in the costs for bilirubin testing in the literature; this issue was subsequently discussed fully. The sensitivity analysis results were reported selectively; it was unclear whether there was systematic selection in favour of one intervention. The level of uncertainty in the data was high. Given the high level uncertainty a probabilistic sensitivity analysis would have been more appropriate and would have allowed for some characterisation of the uncertainty.

**Concluding remarks:**

The conclusions are reasonable given the results obtained. However, they cannot be considered robust given the high level of uncertainty in the data.

**Bibliographic details**

Xie B, Da Silva O, Zaric G. Cost-effectiveness analysis of a system-based approach for managing neonatal jaundice and preventing kernicterus in Ontario. *Paediatrics and Child Health* 2012; 17(1): 11-16

**PubMedID**

23277747

**Original Paper URL**

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3276518/>

**Other publications of related interest**

de Lissovoy G, Matza LS, Green H, Werner M, Edgar T. Cost-effectiveness of intraethecal baclofen therapy for the treatment of severe spasticity associated with cerebral palsy. *J Child Neurol* 2007; 22: 49-59

Ontario Ministry of Health and Long-Term Care – Ontario health insurance – schedule of benefits and fees 2009. Available at: [www.health.gov.on.ca/English/providers/program/ohip/sob/sob\\_mn.html](http://www.health.gov.on.ca/English/providers/program/ohip/sob/sob_mn.html)

Suresh GK, Clark RE. Cost-effectiveness of strategies that are intended to prevent kernicterus in newborn infants. *Pediatrics* 2004; 114(4): 917-924

**Indexing Status**

Subject indexing assigned by CRD

**MeSH**

Humans; Jaundice, Neonatal; Kernicterus; Infant Welfare; Disease Progression; Predictive Value of Tests; Cost-Benefit Analysis

**AccessionNumber**

22012013680

**Date bibliographic record published**

20/06/2012

**Date abstract record published**

04/04/2013