



Federaal Kenniscentrum voor de Gezondheidszorg
Centre Fédéral d'Expertise des Soins de Santé
Belgian Health Care Knowledge Centre

The role of biomarkers in ruling out intracranial injuries in mild cranial trauma

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Background

Mild cranial trauma (mCT) = 79-90% of all cranial trauma

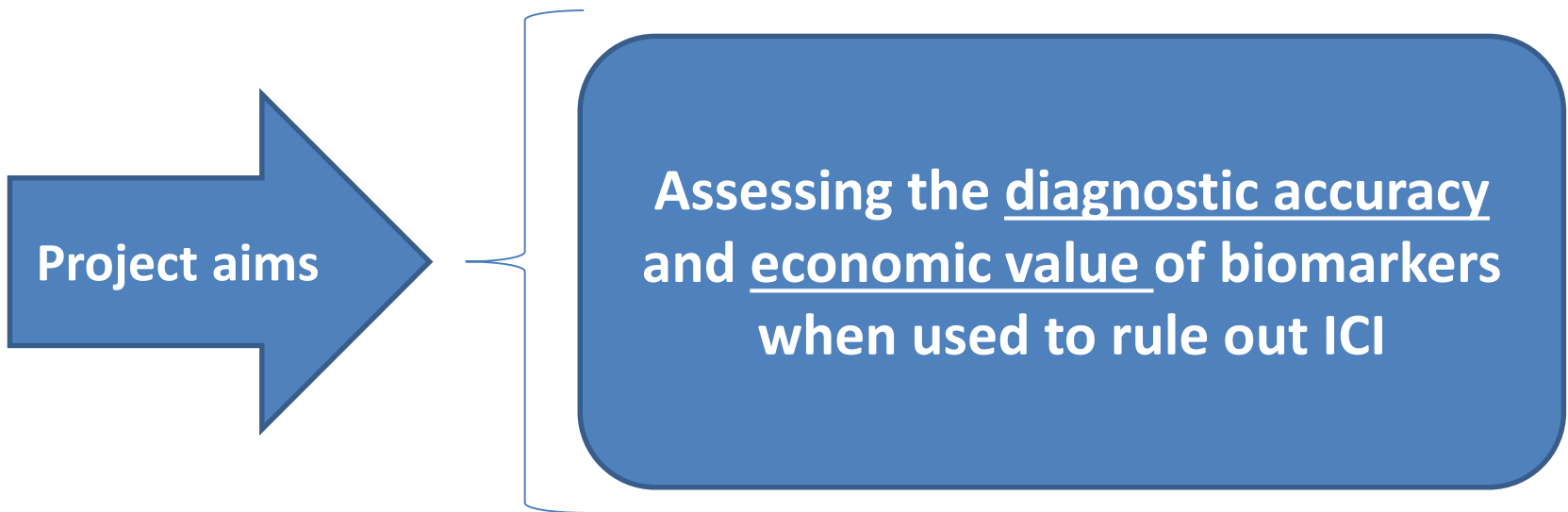
The risk of intracranial injury (ICI) \cong 5%

CT scan=gold standard for diagnosis of ICI but expensive + radiation



Biomarkers could rule out ICI → less CT scans

Objectives



Methodology

Step 1

- Systematic review and meta-analysis of RCTs

Step 2

- Systematic review of the economic literature

Step 3

- Discussions with experts in the field

Biomarkers – Protein S100B

Most evidence related to protein S100B:

Protein secreted by astrocytes that can spill from injured cells and enter the bloodstream

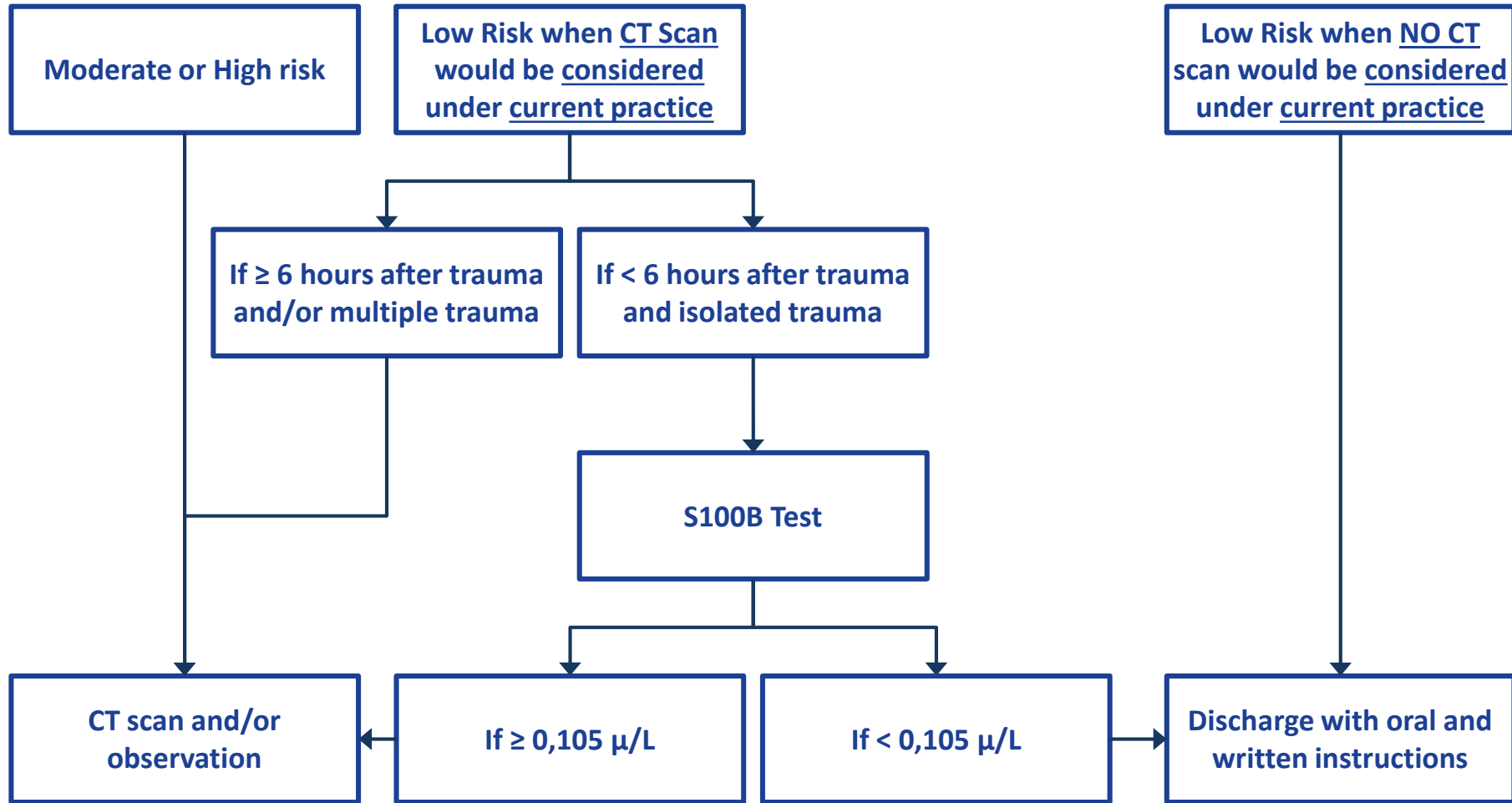
Serum levels of S100B

< 0.105 µg/L



Low risk of ICI in mCT → No scan

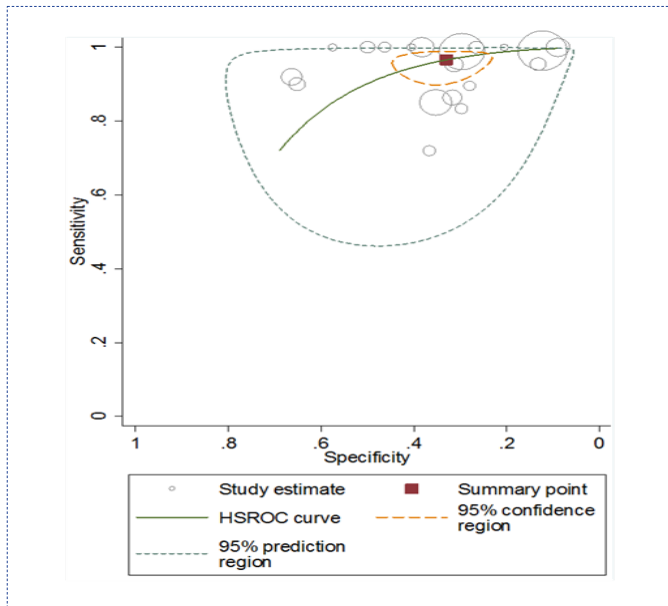
Protein S100B Testing



Results from Meta-analysis

Adults

	Studies	Participants	Se (%)	Sp (%)	LR+	LR-
2011 PANDOR	9	2442	96.9 (91.4; 98.9)	42.0 (31.9; 52.8)	1.67 (1.40; 2.00)	0.07 (0.03; 0.21)
UPDATE KCE 2015	10	3795	95.9 (88.2; 98.7)	26.1 (18.2; 35.8)	1.30 (1.16; 1.45)	0.16 (0.06; 0.43)
ALL	19	6237	96.6 (92.3; 98.5)	33.0 (25.6; 41.4)	1.44 (1.28; 1.62)	0.10 (0.04; 0.23)



1. High quality evidence
2. Sensitivity analysis inconclusive

Results from Meta-analysis

Children

- Sensitivity 99.1% (95%CI: 68.7; 100)
- LR- 0.02 (95%CI: 0.0; 0.3)
- Evidence from just 5 studies (n=469) with high risk of bias → quality of evidence low

No conclusion could be made on the diagnostic accuracy of any other biomarker

Economic literature – S100B

Two economic evaluations identified

- Apparent contradicting results:
 - If used in all mCT patients, cost additive
 - If used only in those who would otherwise receive a CT scan, cost saving

Models very sensitive to:

- The proportion of the mCT population in which the protein S100B test should be used

Conclusions

- **High quality evidence that protein S100B could help to rule out ICI in adults with mCT**
- **Points for attention:**
 - Patient selection
 - Not to be used on patient populations at higher risk of complications (eg on anticoagulants, elderly, with skull fractures, etc)
 - Not to be performed after 6 hours post-trauma
 - Not to be used in patients with multiple trauma
 - **Sensitivity not 100%:**
 - LR - : between 0.04 and 0.23
 - **Appropriate patient targeting/use of biomarker tests could pose challenges**

Recommendations (1)

To the
emergency
department
clinicians:

- Use S100B test in patients with low risk of ICI on clinical grounds (<10%), in which a CT scan would be considered, under current practice.
- If test is negative, do not perform a CT scan
- Do NOT use S100B testing in:
 - Patients with multiple trauma;
 - Patients in which the test cannot be performed within max. 6 hrs after trauma;
 - Patients on anticoagulants or anti-platelet treatment;
 - Patients aged 65+;
 - Children
 - Patients presenting signs of skull fracture;
 - Patients showing any signs or symptoms that would make an active follow-up clinically appropriate, independently of S100B test results.

Recommendations (2)

To the Minister
of Public Health
and Social
Affairs:

- We recommend to reimburse Protein S100B testing in the population/circumstances previously specified
- Monitoring the appropriate use of the test should be encouraged

Recommendations (3)

To the research community:

- Further research on the effectiveness of S100B testing at ruling out ICI in children is required
- Setting up an effectiveness study to assess how the protein is used in real life in Belgium would be of value

Colophon

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