

Reliability of Mortality prognostic scores in Portuguese PICU's



Introdução à Medicina I

CLASS 4¹; OLIVEIRA, R. C. S.²

¹ turma4fmup09@gmail.com; ² rcoliveira@med.up.pt (Adviser)

Reliability of Mortality Prognostic Scores in Portuguese PICU's

“Are they doing a good job?”

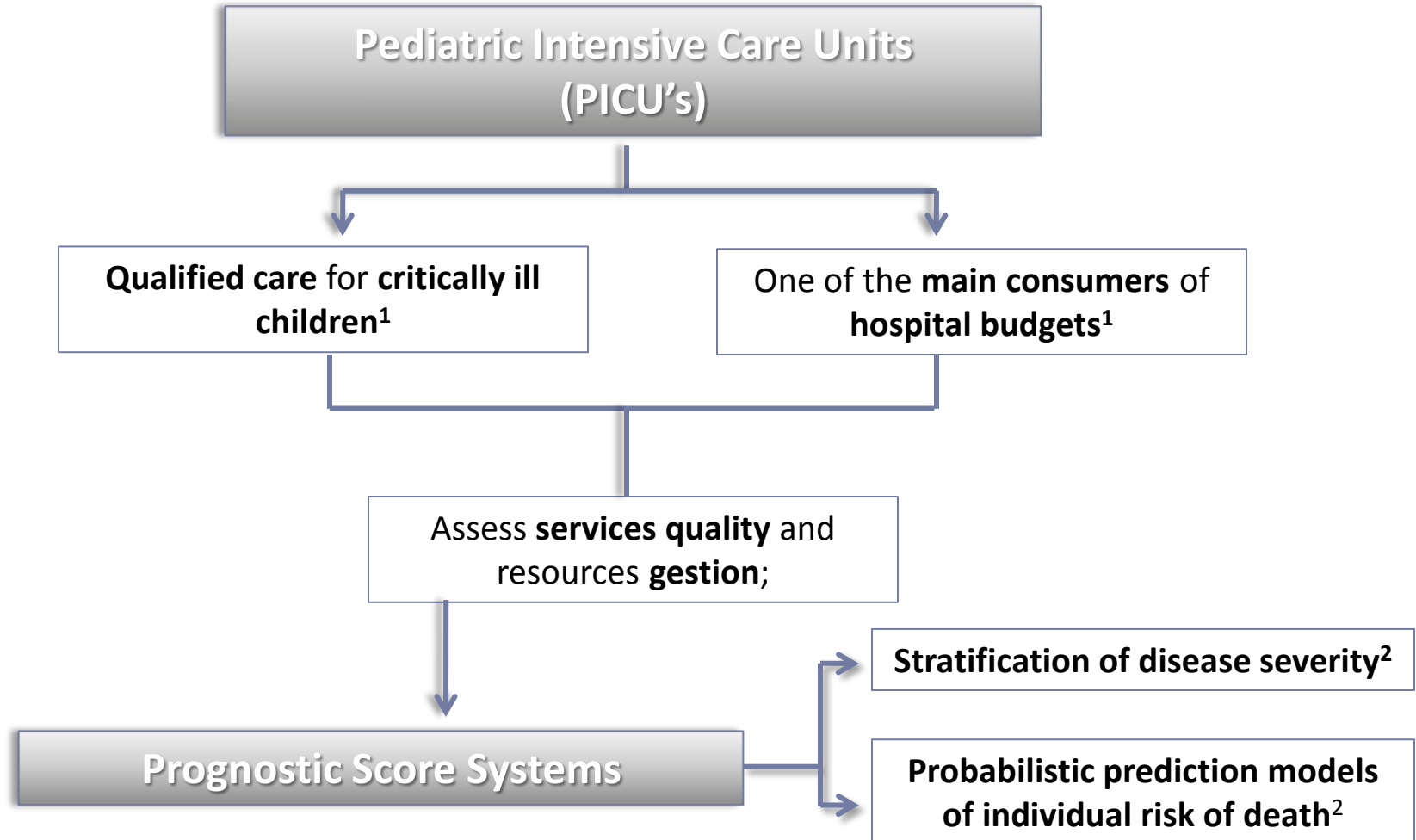
TABLE OF CONTENTS

- ▶ **Introduction**
 - ▶ Context
 - ▶ General Aims
- ▶ **Methods**
 - ▶ Study Design
 - ▶ Data Acquisition
 - ▶ Algorithms calculation
 - ▶ Statistical analysis
 - ▶ Discrimination
 - ▶ Calibration
 - ▶ Explanatory power
- ▶ **Expected Results**
- ▶ **References**
- ▶ **Acknowledgements**

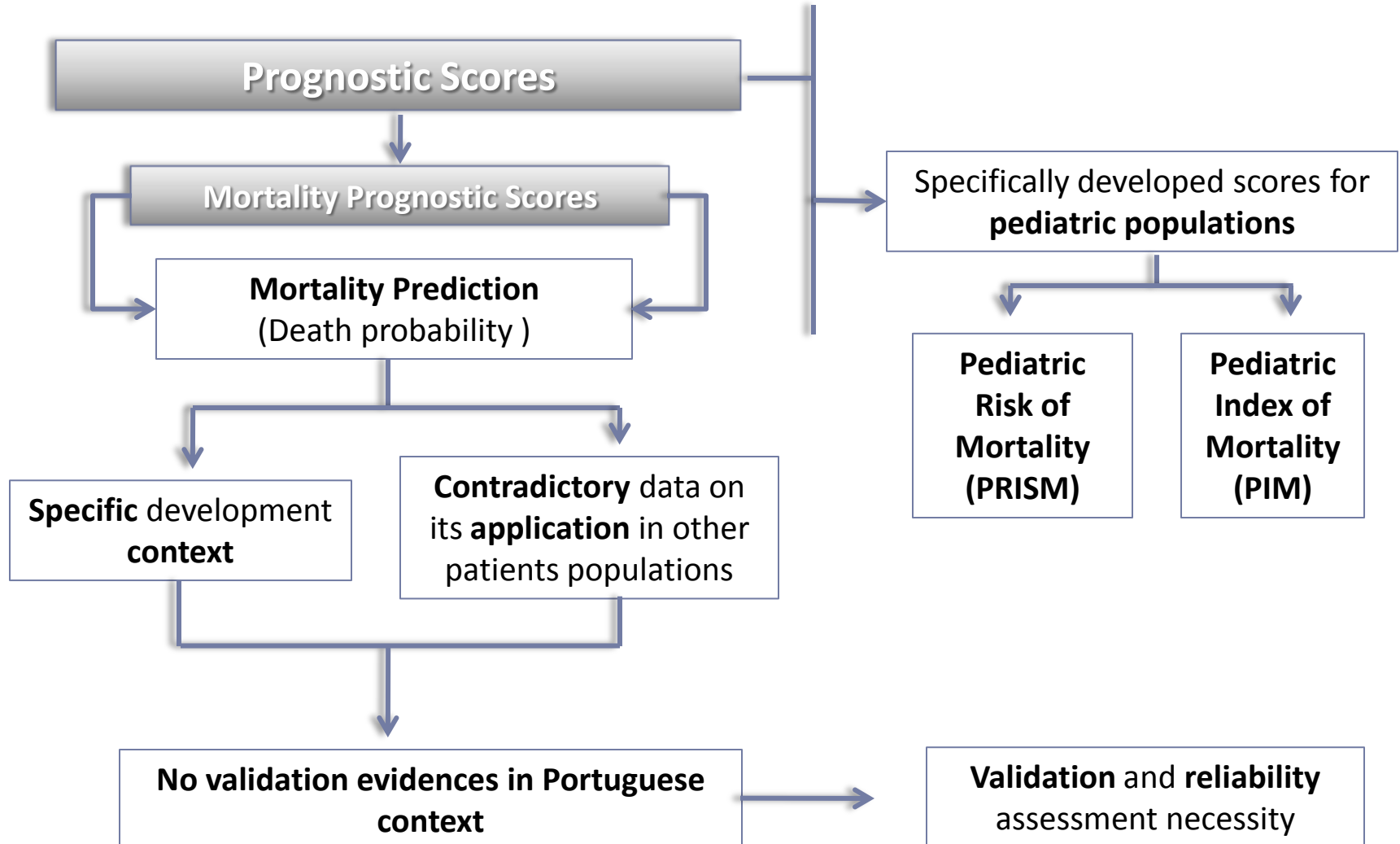
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 - ▶ Context
 - ▶ General Aims
- ▶ **Methods**
 - ▶ Study Design
 - ▶ Data Acquisition
 - ▶ Algorithms calculation
 - ▶ Statistical analysis
 - ▶ Discrimination
 - ▶ Calibration
 - ▶ Explanatory power
- ▶ **Expected Results**
- ▶ **References**
- ▶ **Acknowledgements**

INTRODUCTION



INTRODUCTION



**Are PRISM, PRISM III, PIM and PIM-2
scoring systems reliable in death
prediction at Portuguese PICU's?**

- ▶ **Assessment to Pediatric Risk of Mortality (PRISM, PRISM III) and Pediatric Index of Mortality (PIM and PIM2) systems for use in comparing the risk-adjusted mortality of children after admission for pediatric intensive care in Portugal;**
- ▶ Validation of PRISM, PRISM III, PIM and PIM-2 prognostic scores.
 - ▶ Comparing their **performance** at a general Portuguese Pediatric Intensive Care Units;
- ▶ Statistical evaluation of PRISM, PRISM III, PIM and PIM-2 scoring systems' discrimination, calibration and predictive degree at Portuguese PICU's.

- ▶ Assessment to **Pediatric Risk of Mortality** (PRISM, PRISM III) and **Pediatric Index of Mortality** (PIM and PIM2) systems for use in **comparing the risk-adjusted mortality** of children after admission for pediatric intensive care in Portugal;
- ▶ **Validation** of **PRISM**, **PRISM III**, **PIM** and **PIM-2** prognostic scores.
 - ▶ Comparison of their **performance** at a general Portuguese Pediatric Intensive Care Units;
- ▶ Statistical evaluation of **PRISM**, **PRISM III**, **PIM** and **PIM-2** scoring systems **discrimination, calibration and predictive degree** at Portuguese PICU's.

- ▶ Assessment to **Pediatric Risk of Mortality** (PRISM, PRISM III) and **Pediatric Index of Mortality** (PIM and PIM2) systems for use in **comparing the risk-adjusted mortality** of children after admission for pediatric intensive care in Portugal;
- ▶ Validation of PRISM, PRISM III, PIM and PIM-2 prognostic scores.
 - ▶ Comparison of their **performance** at a general Portuguese Pediatric Intensive Care Units;
- ▶ **Statistical evaluation** of PRISM, PRISM III, PIM and PIM-2 scoring systems' **discrimination, calibration and predictive degree** at Portuguese PICU's;

Reliability

- ▶ The extent to which an experiment, test, or measuring procedure yields the **same results on repeated trials.**³

Validation

- ▶ An integrated evaluative judgment of the degree to which **empirical evidence and theoretical rationales support the adequacy and appropriateness of inferences** and actions based on test scores or other modes of assessment.⁴

SUMMARY

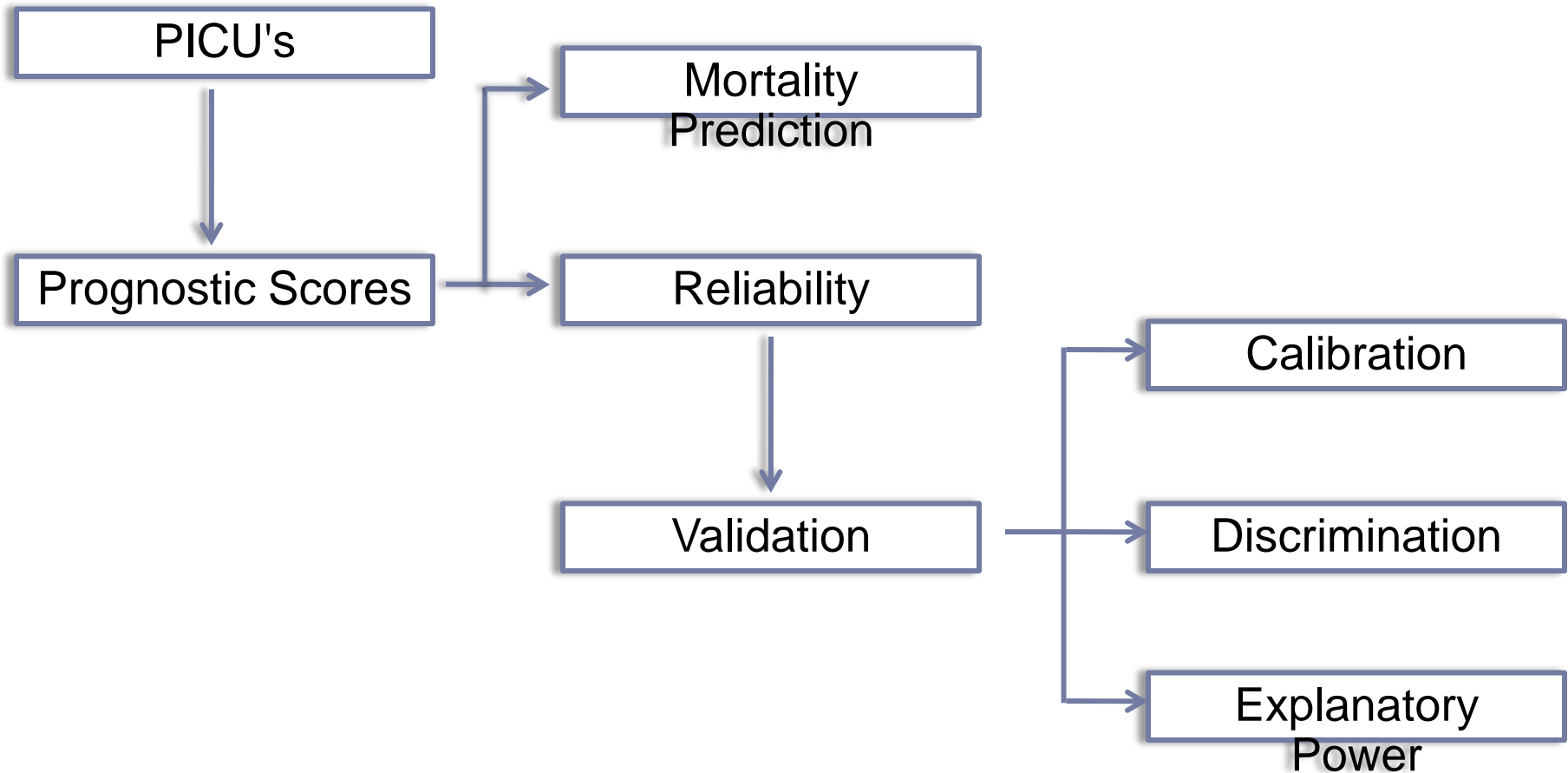


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- ▶ Expected Results

I) Data acquisition

II) Algorithms calculation

III) Statistical validity assessment

→ Via SPSS and other Microsoft Office resources

Standard Criteria

- Discrimination
- Calibration
- Explanatory power

Bases of defined strategy

- ▶ Precursor project – **REUNIR** (*Recolha Uniformizada e Nacional de Informação Relevante*);
- ▶ Conducted Study in UK (same thematic and analytical bases);⁵
- ▶ Other Prognostic Scores Validation Studies in Portugal [e.g. **APPACHE** (*Acute Physiology, Age, Chronic Health Evaluation*), **SABS** (*Clinical Risk Index for Babies*)];⁶

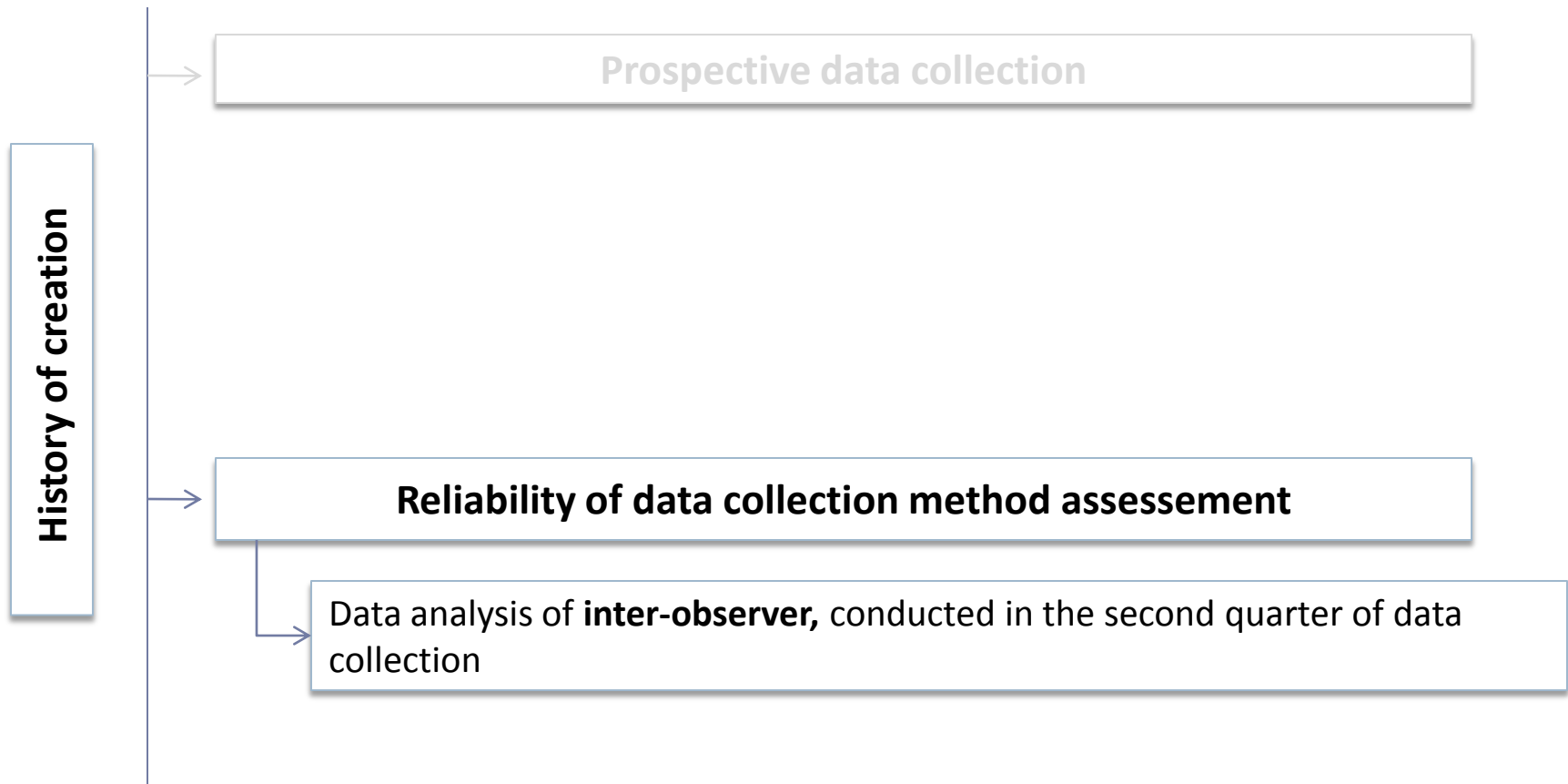
I) Previously created database

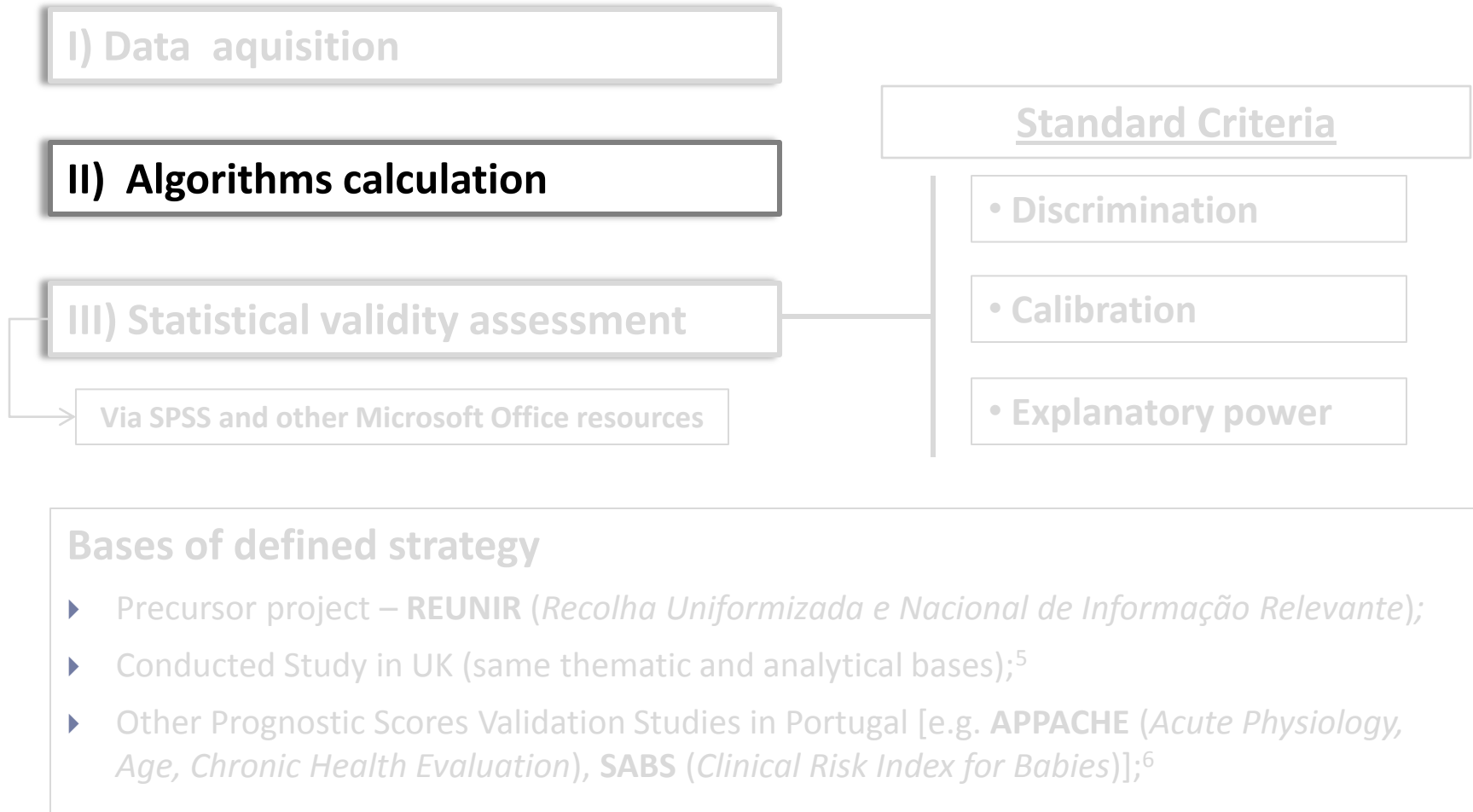
History of creation

Prospective data collection

- **Time of collection:** 30 months
- **Institutions of collection:** 3 volunteers Portuguese PICU's (Hospital Pediátrico de Coimbra - Coimbra, Hospital D. Estefânia - Lisbon, Hospital São João - Oporto)
- **Dimension:** 2000 patients
- **Inclusion / Exclusion criteria:** All admissions between 29 days and 16 years old; No more criteria are known;
- **Data:** All necessary data for PIM, PIM II, PRISM, PRISM III calculation (Routinely collection; Added pro-form);

I) Previously created database





ALGORITHMS CALCULATION

- I) According to **published equations**;
- II) Informatic **software applications** of Pediatric Mortality Prognostic Scores calculation;

Example:

"A clinical case simulation"

P.I.M. - Windows Internet Explorer

F:\Algoritmos online\pim2.html

P.I.M.

PIM
(Paediatric Index of Mortality)

Variables (help)	Values (1 if Yes, 0 otherwise)	Beta
Elective admission (help)	<input type="checkbox"/>	0
Underlying condition (help)	<input type="checkbox"/>	0
Response of pupils to bright light (> 3 mm and both fixed)	<input type="checkbox"/>	0
Mechanical ventilation (at any time during first hour in ICU)	<input type="checkbox"/>	0
Systolic Blood Pressure (mmHg)	120	0.021
Base excess (mmHg) (arterial or capillary blood)	0	0.071
FiO2 (%) / PaO2 (mmHg)	0	0.415

Predicted Death Rate (help)

Concluido

<http://www.sfar.org/scores2/pim2.html>

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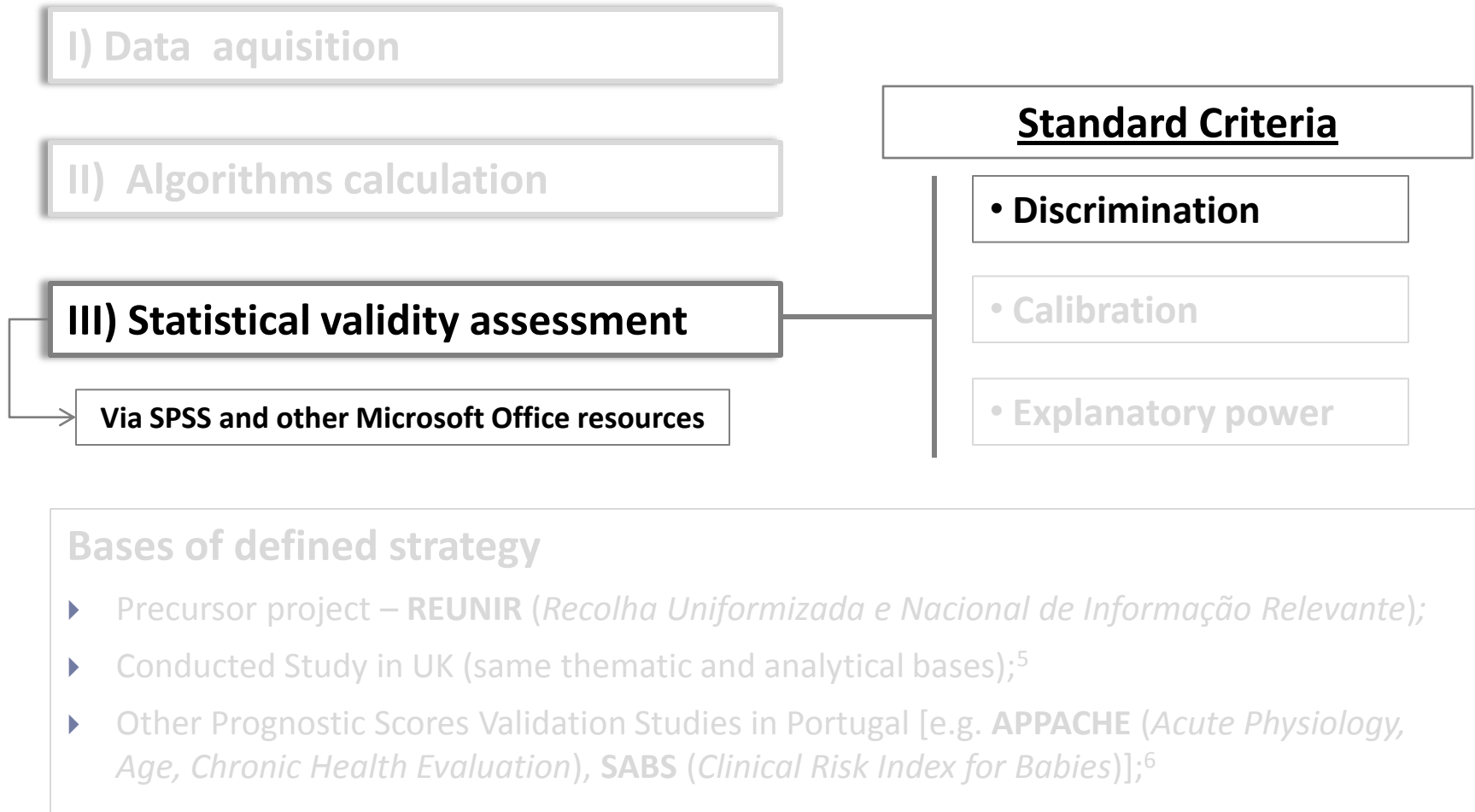
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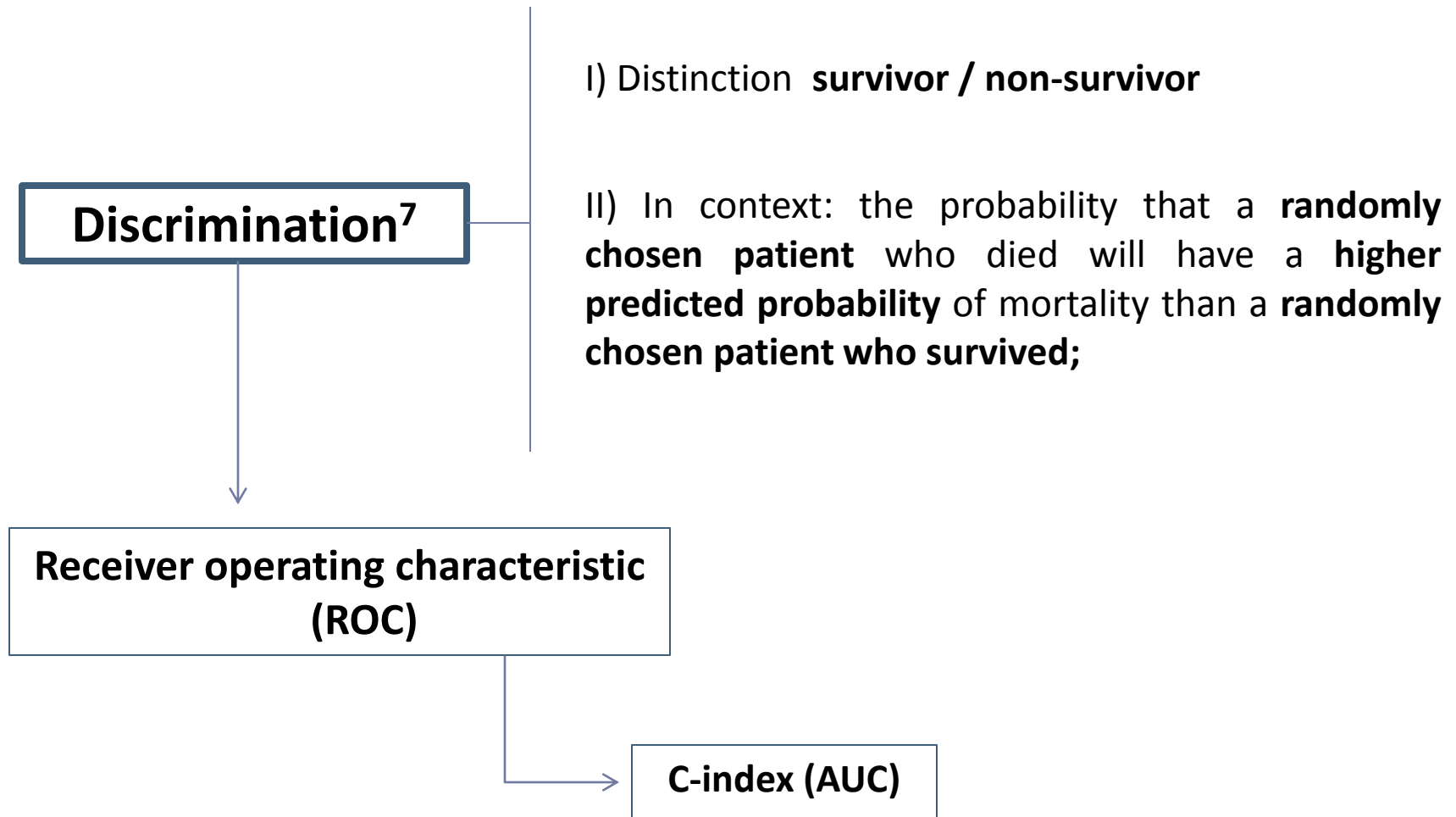
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STUDY DESIGN

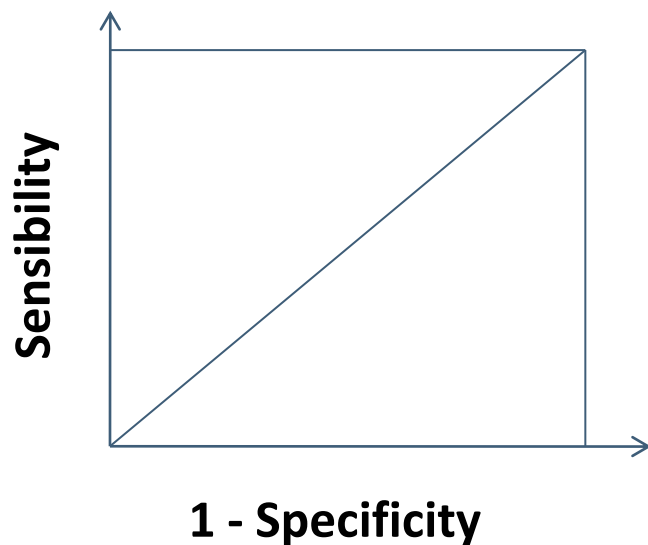


DISCRIMINATION

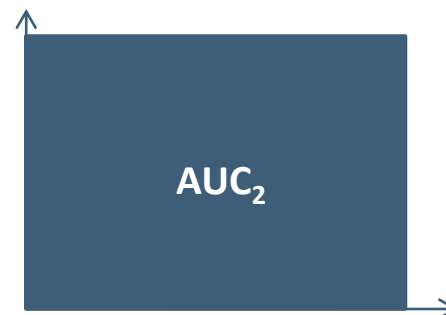


DISCRIMINATION

ROC Curves



Lowest discrimination power

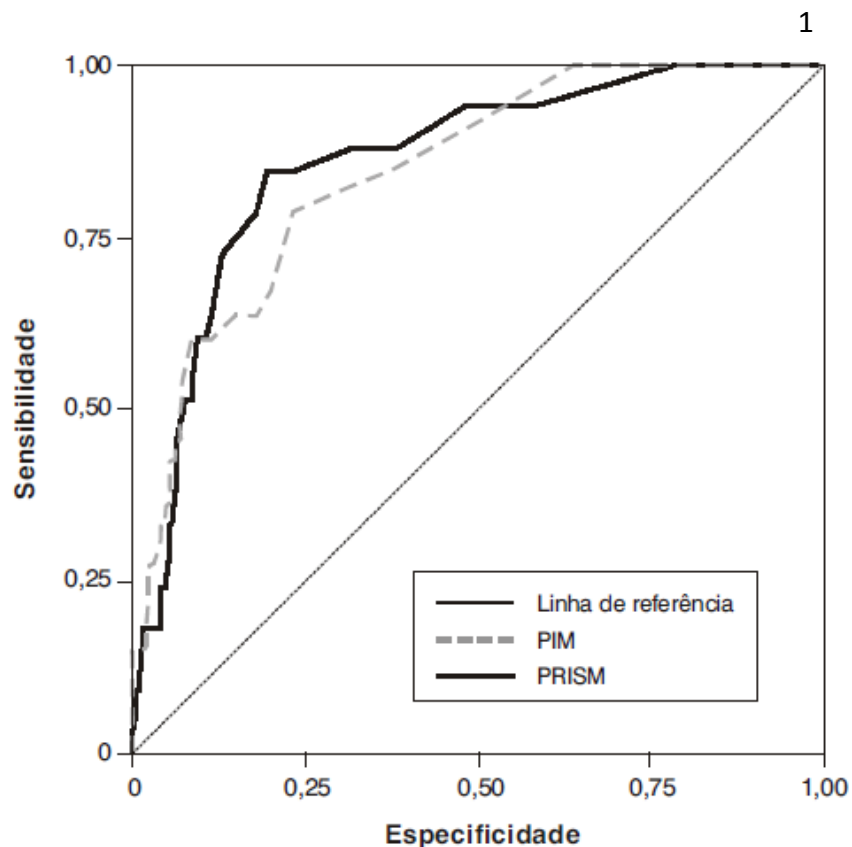


Highest discrimination power

C-index (AUC)²

- ≥ 0.7 acceptable
- ≥ 0.8 good
- ≥ 0.9 excellent

DISCRIMINATION



C – index (AUC)

PRISM – 0,87

PIM – 0,85

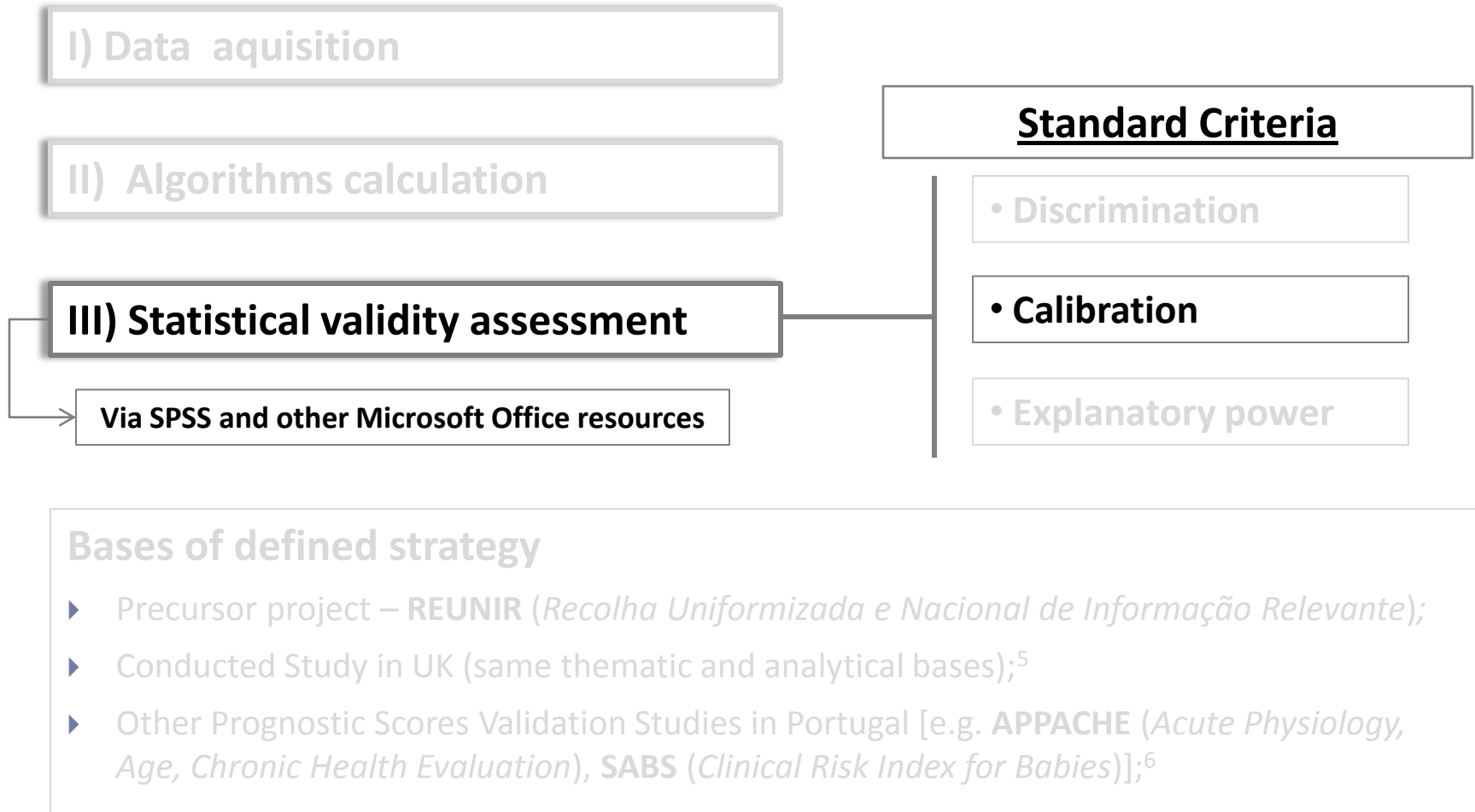
C-index (AUC)²

≥ 0.7 acceptable

≥ 0.8 good

≥ 0.9 excellent

PRISM - Pediatric Risk of Mortality; PIM – Pediatric Index of Mortality; AUC – Area Under Curve



Calibration⁸

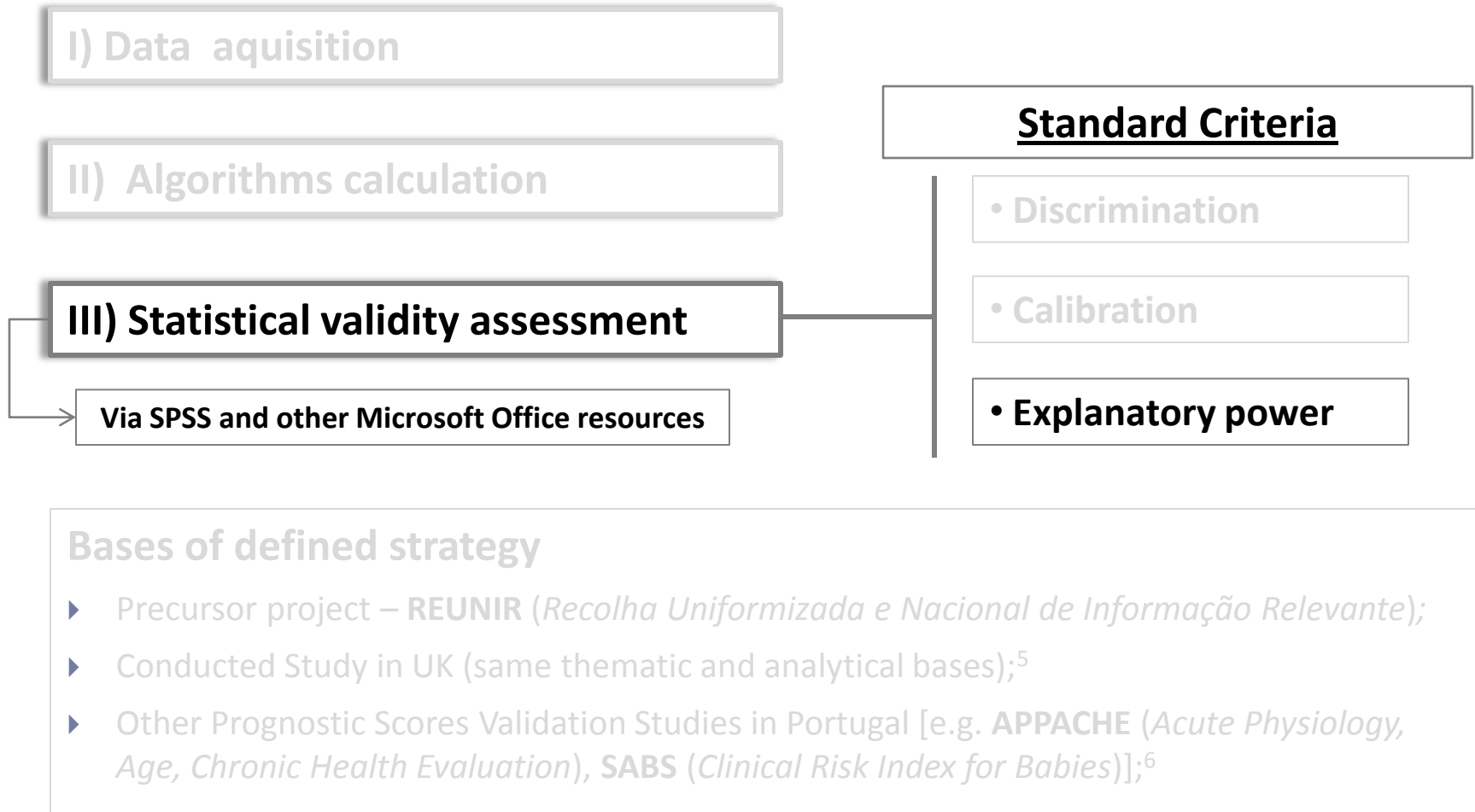
The ability of a model to **match predictive and observed** death rates across the entire spread of data.

Calibration⁸



**Goodness-of-fit Hosmer
Lemeshow test**

- I. **Classification** into $g=10$ (or possibly less) decile of **risk groups** based on the values of the **estimated probabilities**.
- II. **Ordinaire X^2 test** for the mean of the **predicted probability** against the **observed fraction of events**.
- III. **If** the model predicts **well**, the **events** will be **concentrated in the highest risk groups**.



EXPLANATORY POWER

Explanatory Power⁹

More complex model vs Simpler model
Is a particular dataset significantly better?

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More complex model vs Simpler model
Is a particular dataset significantly better?



Log Likelihood Ratio Test

- I. How many times more (or less) likely **patients with the disease** are to have particular outcome than **patients without the disease**;
- II. Objective criterion for **selecting among possible models**;

- **> 1** test result associated with outcome
- **< 1** test result not associated with outcome

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EXPECTED RESULTS

Score models are expected to predict mortality satisfactorily in Portuguese Pediatric Intensive Care context

Restrictions in discrimination and calibration capabilities

EXPECTED RESULTS/LIMITATIONS

Score models are expected to predict mortality satisfactorily in Portuguese Pediatric Intensive Care context

Restrictions in discrimination and calibration capabilities are also admitted

LIMITATIONS

Score models are expected to predict mortality satisfactorily in Portuguese Pediatric Intensive Care context

Restrictions in discrimination and calibration capabilities are also admitted

Possible bias on data collection

ACKNOWLEDGEMENTS

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THANK YOU!
ANY QUESTIONS?



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