

Evaluation of the medical procedures on an administrative database to identify patients with suspected preeclampsia in the Brazilian Private Healthcare System

Rodrigo Ho, Mariana Mioti, João Carvalho, Marisa D’Innocenzo, Adriana Vassalli, Micha Nussbaum

Roche Diagnostic, São Paulo, SP, Brasil.



1

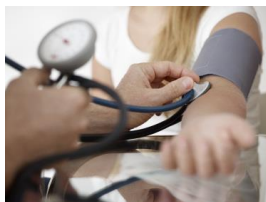
Disclosure

- Rodrigo is employee of Roche Diagnostic
- This study was sponsored by Roche Diagnostic

2

Preeclampsia (PE)

A serious hypertensive disorder in pregnancy¹



- Defined² as a **new onset** of
 - **Hypertension** (> 140 / 90 mmHg)
 - **Proteinuria**

And/or

Evidence of maternal acute kidney injury (AKI), liver dysfunction, neurological features, hemolysis or thrombocytopenia, or fetal growth restriction.

after 20 weeks of gestation



>500 000



Fetal and neonatal deaths²

>70 000



Maternal deaths²

1Brown, M.A., et al., (2001). Hypertens Pregnancy; 20(1): ix-xiv; 2Brown MA, Magee LA, Kenny LC, Karumanchi SA, Mccarthy FP, Saito S, et al. Hypertensive Disorders of Pregnancy ISSHP Classification, Diagnosis, and Management Recommendations for International Practice. 2018;24-43.w

3

Preeclampsia

Epidemiology

Epidemiology



Pregnant women



10 % suspected PE¹



80% do not develop PE¹



Patient with suspected PE



Unnecessary hospitalizations²



Stress in pregnancy³



Associated with high costs⁴

There is no technology incorporated in Brazil to improve the management of these patients.

1Milne F, Redman C, Walker J, Baker P, Black R, Blincowe J, et al. Guidelines: Assessing the onset of pre-eclampsia in the hospital day unit: Summary of the pre-eclampsia guideline (PRECOG II). BMJ. 2009;339(7721):626-8. 2. Caillon H, Tardif C, Dumontet E, Winer N, Masson D. Evaluation of sFlt-1/PlGF ratio for predicting and improving clinical management of pre-eclampsia: Experience in a specialized perinatal care center. Ann Lab Med. 2018;38(2):95-101.3. Schetter C, Tanner L. Anxiety, depression and stress in pregnancy: implications for mothers, children, research, and practice. Curr Opin Psychiatry. 2012;25(2):141-8. 4. Figueira, S. F. et al. (2018). Pregnancy Hypertension, 13(December 2017), pp. 30-36. doi: 10.1016/j.preghy.2018.04.014.

4

sFlt-1:PIGF ratio in women with suspected PE

Biomarkers associated with PE

Clinical utility

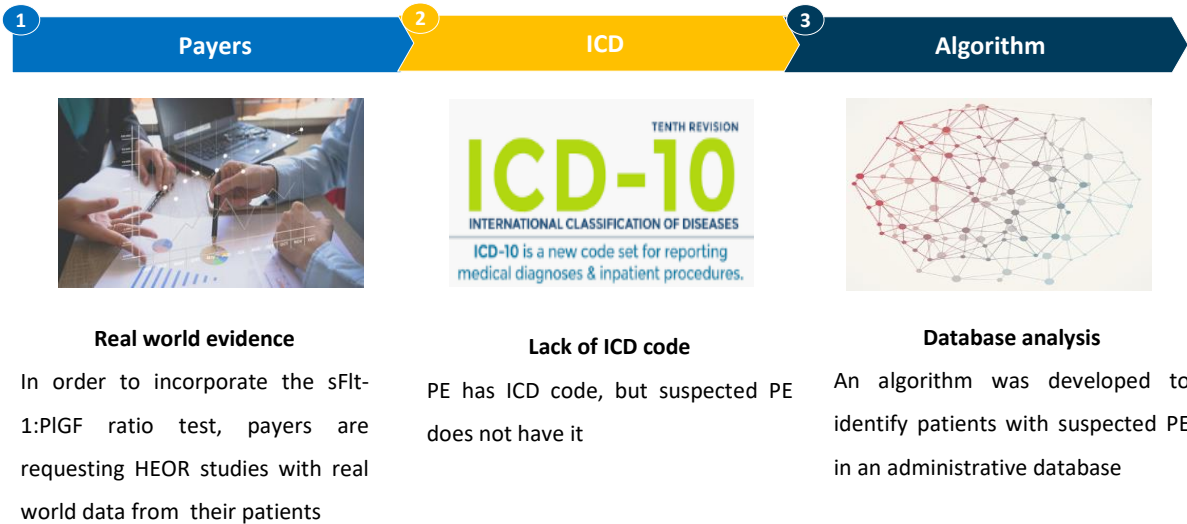
The sFlt-1:PIGF ratio test has the potential to improve clinical decisions and generate savings²



1. Zeisler H, Llurba E, Chantraine F, Vatish M, Staff AC, Sennstrom M, et al. Predictive Value of the sFlt-1: PIGF Ratio in Women With Suspected Preeclampsia. Obstet Gynecol Surv. 2016;71(5):273-4. 2. Figueira, S. F. et al. (2018). Pregnancy Hypertension, 13(December 2017), pp. 30-36. doi: 10.1016/j.preghy.2018.04.014.

5

Context



6

Algorithm development



Identify similarities among patients before PE diagnosis



Suspected of PE



Procedures use to
manage these
patients



Diagnosis of PE

1Milne F, Redman C, Walker J, Baker P, Black R, Blincowe J, et al. Guidelines: Assessing the onset of pre-eclampsia in the hospital day unit: Summary of the pre-eclampsia guideline (PRECOG II). BMJ. 2009;339(7721):626-8.

7

Algorithm development



Steps to develop the algorithm

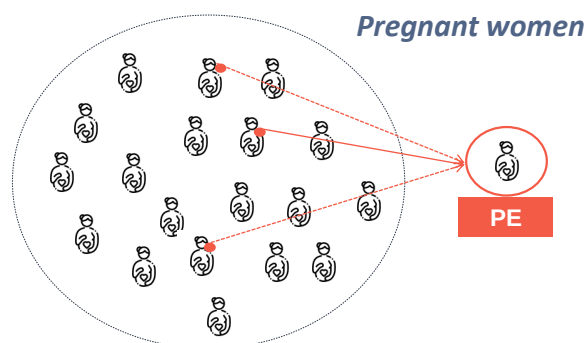


Data collection from the private healthcare system in Brazil



8

Data collection



ICD 10	Description
O14	Gestational [pregnancy-induced] hypertension with significant proteinuria
O14.0	Moderate pre-eclampsia
O14.1	Severe pre-eclampsia
O14.9	Pre-eclampsia, unspecified

Time horizon: **January 2016 to December 2017**

Patients with PE were extracted from database using the ICD codes

9

Algorithm development

Steps to develop the algorithm



Data collection from the private healthcare system in Brazil



Analysis of ICD codes prior to the development of PE

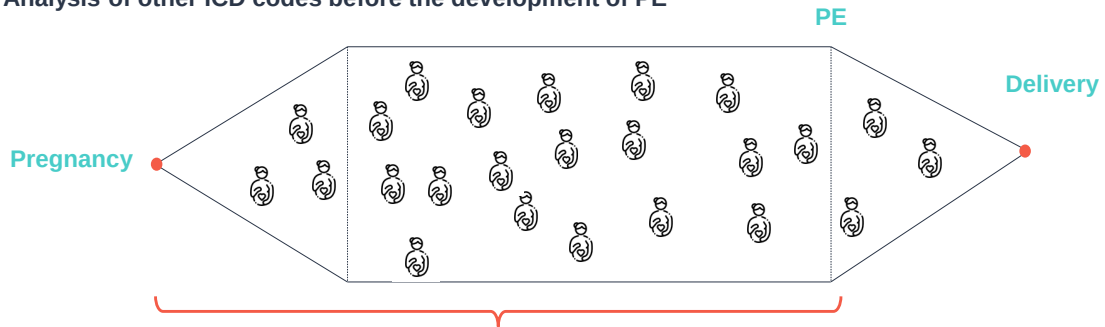


10

Analysis of ICD

Restrospective study

Analysis of other ICD codes before the development of PE

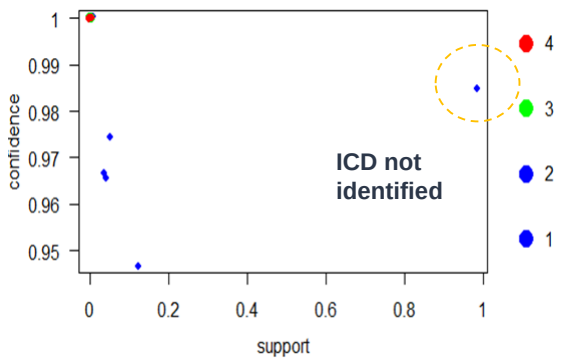


727 patients were analysed with 45 different ICD codes

11

Analysis of ICD

Restrospective study



Confidence: conditional probability

Support: frequency of occurrence

98.6%

Procedures were performed in patient with ICD not identified

The analysis considered only procedures in patient with ICD not identified

12

Algorithm development

Steps to develop the algorithm



Data collection from the private healthcare system in Brazil



Analysis of ICD codes prior to the development of PE



Evaluation of the occurrence of procedures that were possible related to the management of patient with suspected PE



13

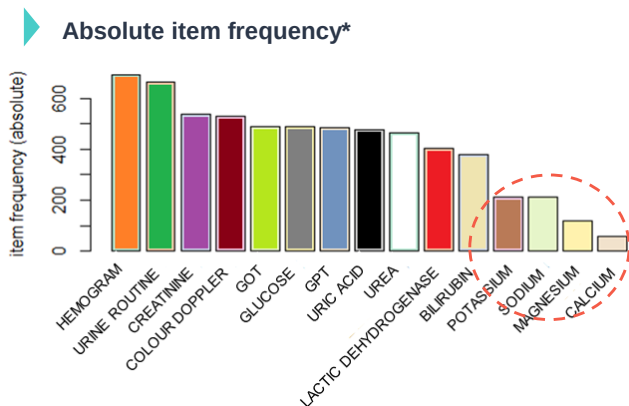
Procedures evaluated

PROCEDURES
BILIRUBIN
CREATININE
LACTIC DEHYDROGENASE
GLUTAMIC OXALOACETIC TRANSAMINASE (GOT)
GLUTAMIC PIRUVIC TRANSAMINASE (GPT)
HEMOGRAM
UREA
URINE ROUTINE EXAMINATION
COLOUR DOPPLER
URIC ACID
POTASSIUM
SODIUM
MAGNESIUM
GLUCOSE
CALCIUM

14

Procedures

Procedures that occur before the preeclampsia ICD code



Analysis

Frequency of measuring the levels of K^+ , Na^+ , Mg^+ and Ca^{2+} were very low



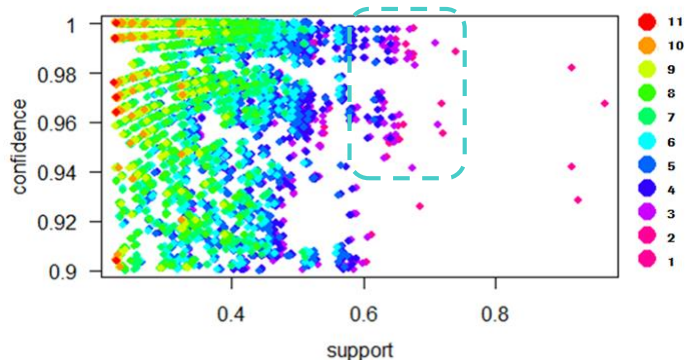
They were not considered in the analysis

15

Procedures

Procedures that occur before the preeclampsia ICD code

Combination of procedures



Conditional probability

{}	=> {URINE ROUTINE}
{LACTIC DEHYDROGENASE}	=> {HEMOGRAM}
{BILIRUBIN}	=> {LACTIC DEHYDROGENASE}
{LACTIC DEHYDROGENASE}	=> {BILIRUBIN}
{GLUCOSE}	=> {URINE ROUTINE}
{URIC ACID}	=> {LACTIC DEHYDROGENASE}
{BILIRUBIN}	=> {CREATININE}
{LACTIC DEHYDROGENASE}	=> {GOT}

Clusters were created with 3 and 4 procedures

16

Algorithm development



Steps to develop the algorithm



Data collection from the private healthcare system in Brazil



Analysis of ICD codes prior to the development of PE



Evaluation of the occurrence of procedures that were possible related to the management of patient with suspected PE



Algorithm development that can identify patient with suspected PE

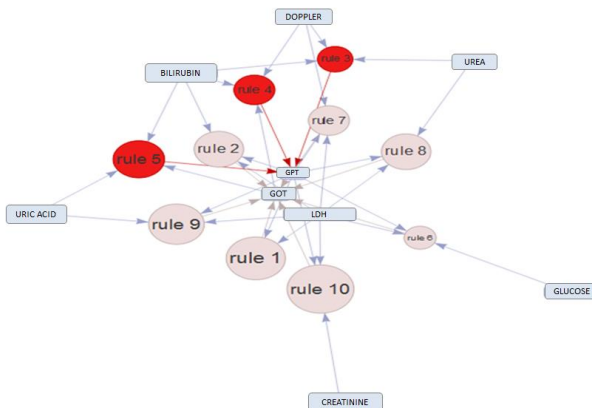


17

Algorithm development

Cluster development

► Probability of combination were studied



► Clusters of procedures

The cluster was chosen based on their accuracy



Sensibility



Specificity

18

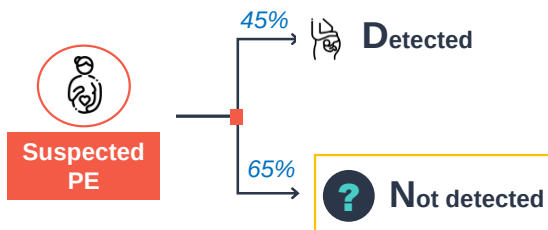
Algorithm development

Testing the sensibility and specificity



Evaluation of accuracy of each cluster

Testing cluster of procedures



Cluster 1

LACTIC DEHYDROGENASE
GPT
GOT
COLOUR DOPPLER



Sensibility = 45%

Specificity = 88%

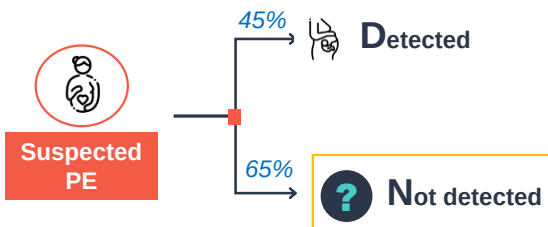


Need to combine new clusters to increase the sensibility

19

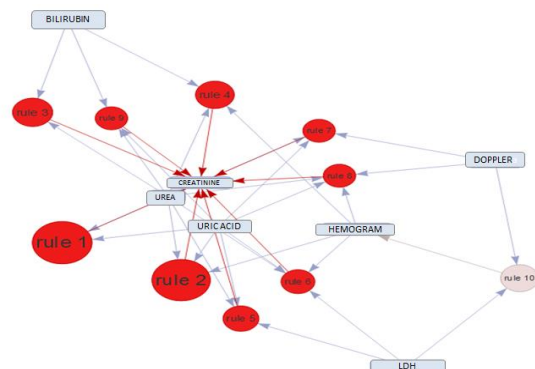
Algorithm development

New clusters development



New clusters were developed based on undetected patients

Probability of new combination



20

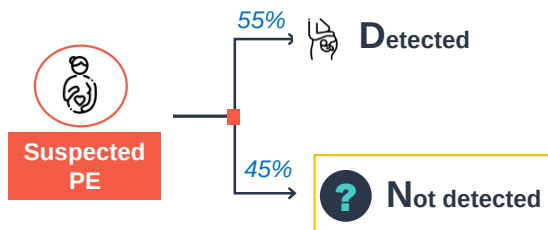
Algorithm development

Testing the sensibility and specificity



Evaluation of clusters combination accuracy

Cluster 1 + Cluster 2



Cluster 1



Sensibility = 45%

Specificity = 88%

Cluster 1 + Cluster 2



Sensibility = 55%

Specificity = 83%

Cluster 2

CREATININE
UREA
COLOUR DOPPLER

21

Algorithm development

Testing the sensibility and specificity

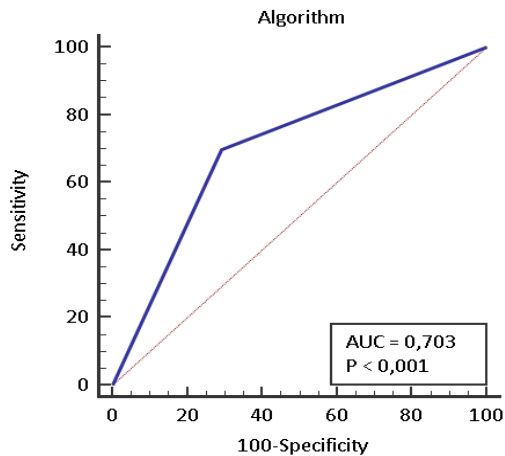
Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
LACTIC DEHYDROGENASE	CREATININE	HEMOGRAM	GOT	LACTIC DEHYDROGENASE
GOT	UREA	URIC ACID	LACTIC DEHYDROGENASE	URIC ACID
GPT	COLOUR DOPPLER	COLOUR DOPPLER	URINE ROUTINE	UREA
COLOUR DOPPLER				

* Procedures occur 112 days prior to delivery

22

Algorithm development

Testing the sensibility and specificity

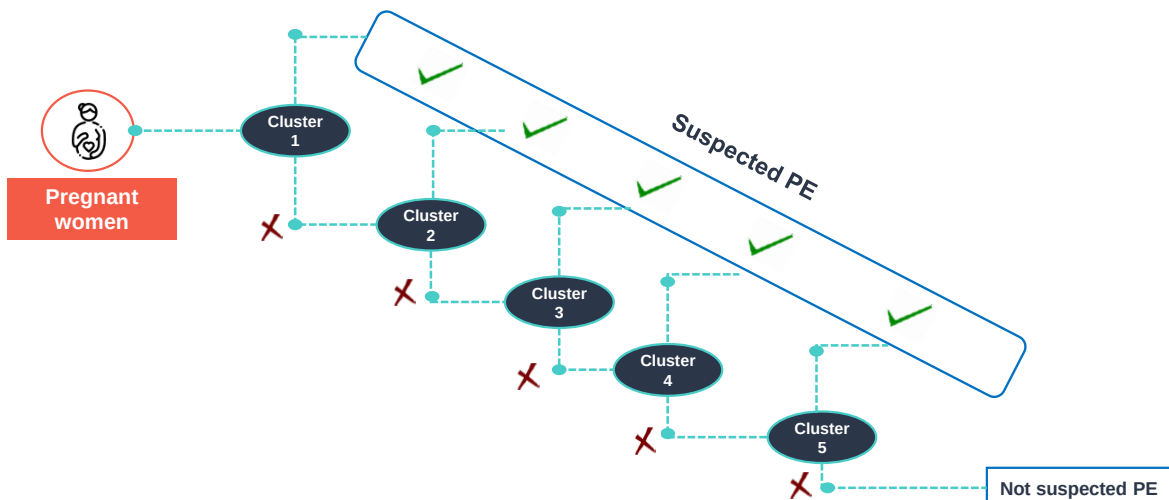


	IC 95%
Sensitivity	70% (66.3 - 73.2)
Specificity	71% (57.3 - 81.9)
Accuracy	70% (66.9 - 73.5)
p-value	<0.0001

The algorithm can detect patient with suspected PE with 70% of accuracy

23

Algorithm



24

Conclusion



The methodology presented in this study demonstrated a high accuracy in detecting patients with health conditions that do not have ICD codes

25

Doing now what patients need next

26