To develop intelligent, personalized technologies

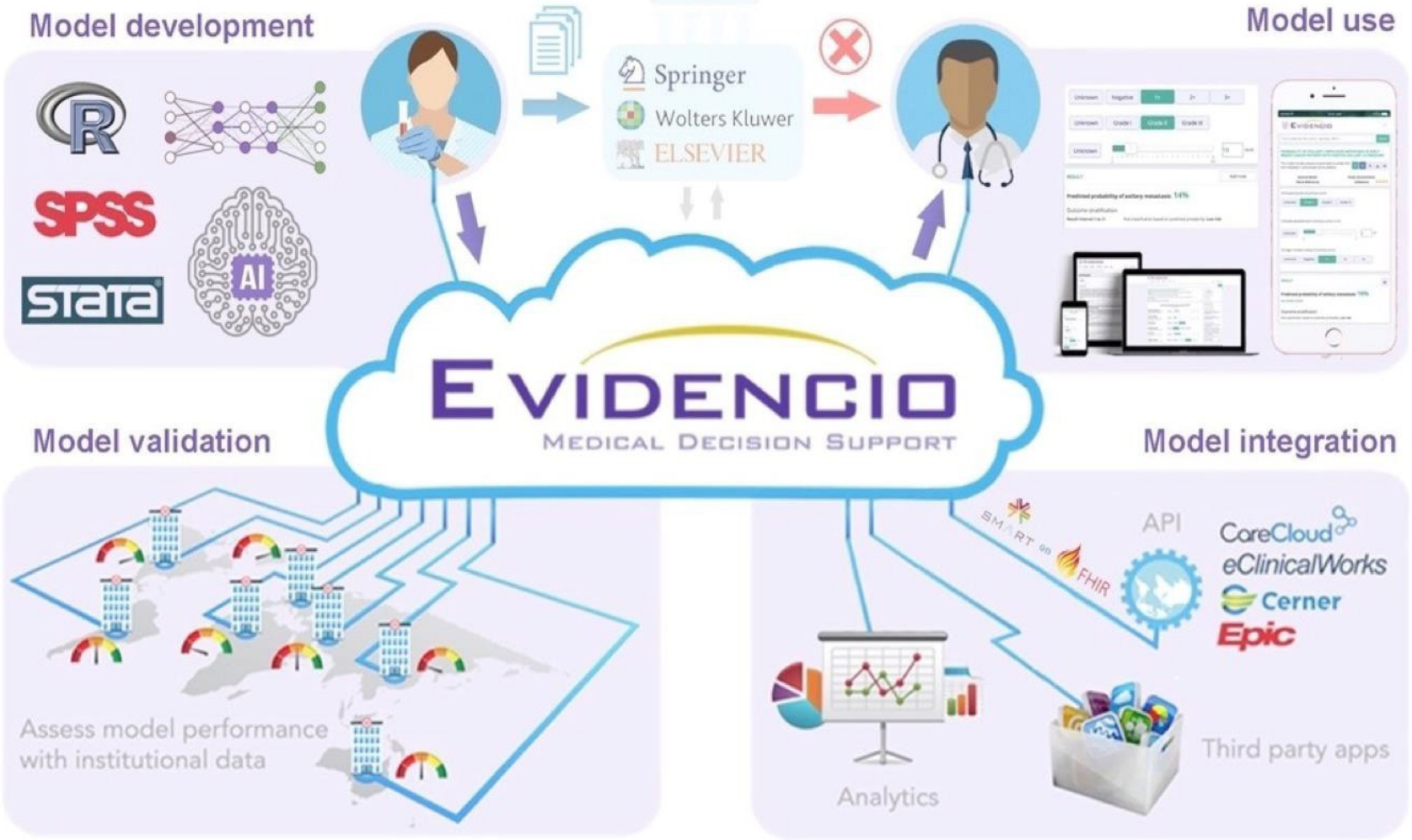
Dr. Tom Hueting - Evidencio

DISCLOSURE SLIDE

Employee at Evidencio B.V.

The Evidencio platform

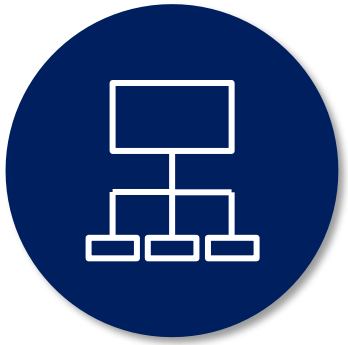
Bridging the gap between scientific output and clinical implementation



What is a medical algorithm?

Any **calculation**, **formula**, statistical **survey**, **nomogram** or **look-up table** useful in healthcare.

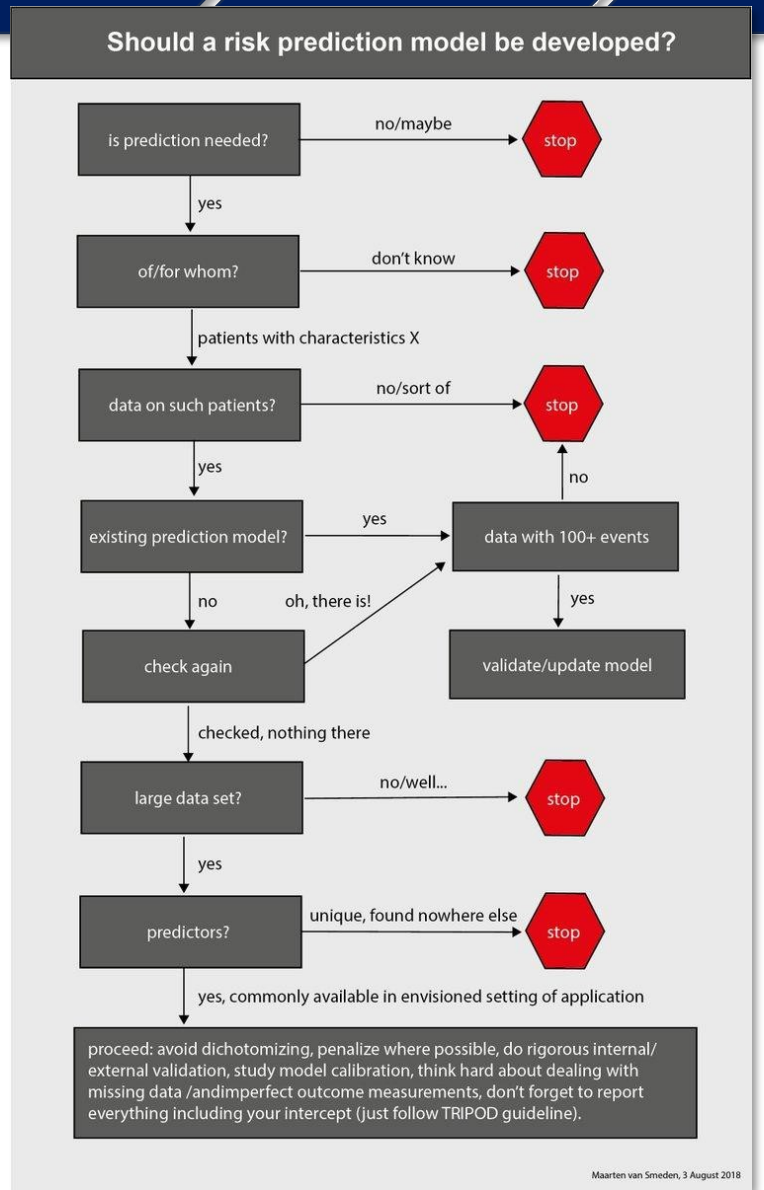
Can contain **heterogeneous** and **multimodal** data

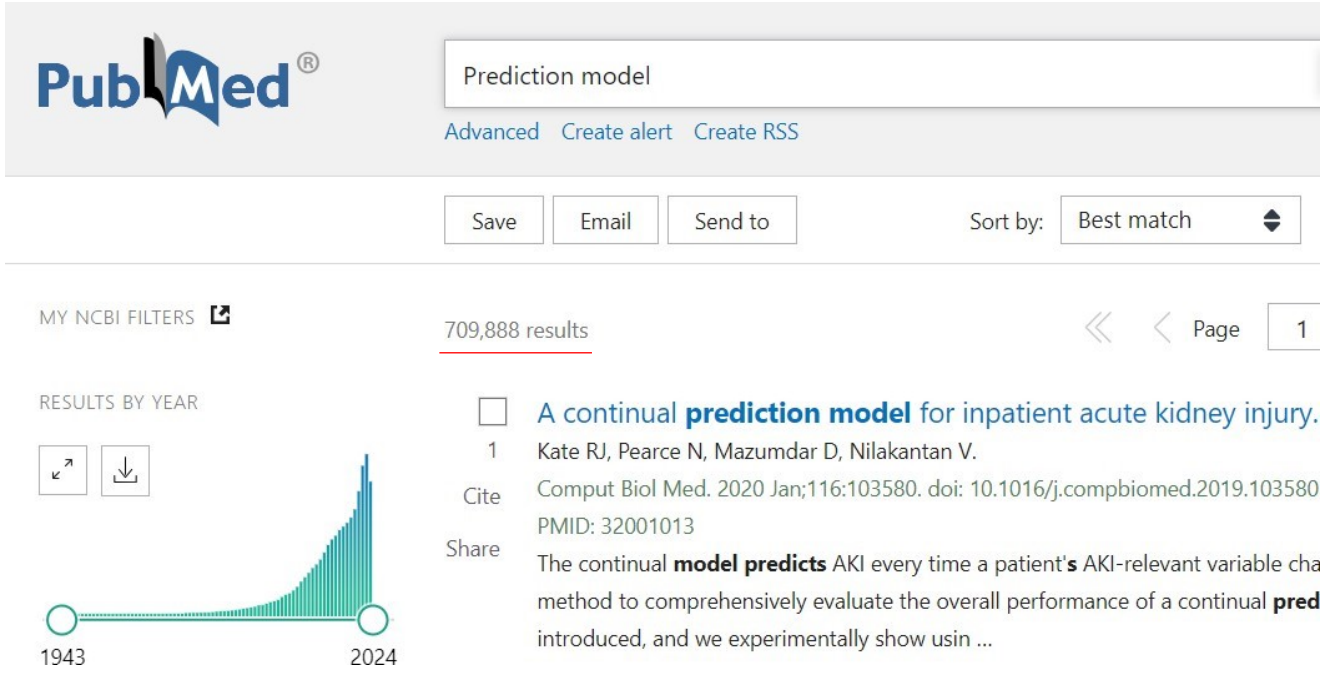


Include **decision trees** and **tools** for reducing or defining **uncertainty**.

Prediction model lifecycle

Problem definition | Data collection | Development | Validation & update | Impact assessment | Clinical adoption





New article: **“Development and validation of a prediction model for outcome X in patients with disease Y”**

Development and **Validation** of a **Prediction** Model for Hepatitis B Virus-Related Hepatocellular Carcinoma Patients Receiving Postoperative Adjuvant Transarterial Chemoembolization.

Tu X, Zhang J, Li M, Lu F, Wang T, Gong W, Xiang B.

J Hepatocell Carcinoma. 2023 Oct 24;10:1881-1895. doi: 10.2147/JHC.S422565. eCollection 2023.

PMID: 37901717 Free PMC article.

Development and **Validation** of a Nomogram for Renal Survival **Prediction** in Patients with Autosomal Dominant Polycystic Kidney Disease.

Wang X, Zheng R, Liu Z, Qi L, Gu L, Wang X, Zhu S, Zhang M, Jia D, Su Z.

Kidney Dis (Basel). 2023 Jun 6;9(5):398-407. doi: 10.1159/000531329. eCollection 2023 Oct.

PMID: 37901714 Free PMC article.

Development and **validation** of a nomogram for **predicting** pulmonary complications after video-assisted thoracoscopic surgery in elderly patients with lung cancer.

Zhao D, Ma A, Li S, Fan J, Li T, Wang G.

Front Oncol. 2023 Oct 13;13:1265204. doi: 10.3389/fonc.2023.1265204. eCollection 2023.

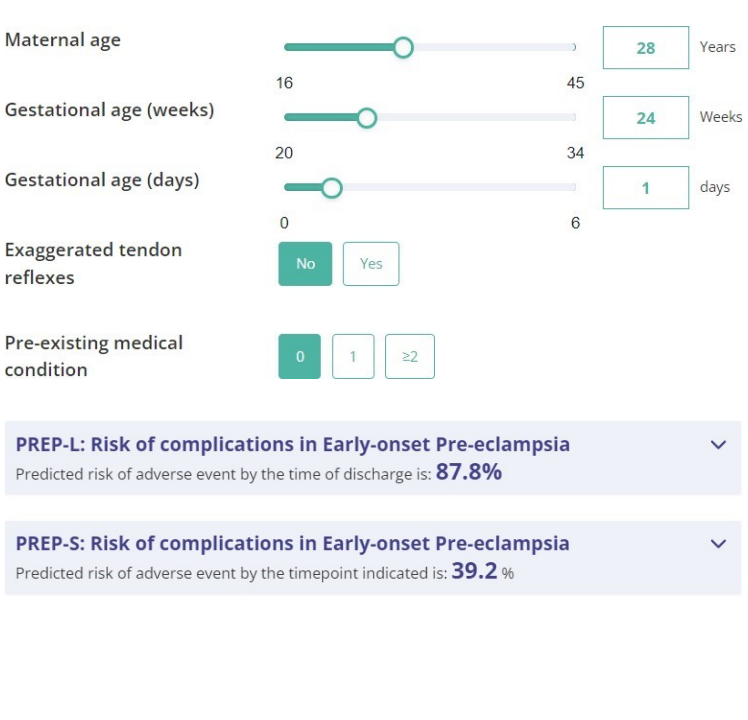
PMID: 37901337 Free PMC article.

Development and **validation** of a nomogram for preoperative **prediction** of

Box 1: Full PREP prognostic models to calculate the risk of adverse maternal outcomes in women with early onset pre-eclampsia

a. Risk at various time points from diagnosis until 34 weeks' gestation using the survival model (PREP-S) $S_{(t)} = S_0(t)^{\S} \wedge \exp((\beta_1 * X_1 + \cdots + \beta_n * X_n))$ $S_{(t)} = S_0(t) \wedge \exp(-0.031 * \text{maternal age} + 1.514 * ((\text{Log(GA at diagnosis/10)})^{-2} - 0.8345136) + 5.707 * ((\text{Log(GA at diagnosis/10)})^{-2} * \ln(\text{log(GA at diagnosis/10)}) - 0.0652155) + 0.122$ (exaggerated tendon reflexes) – 0.169 (one pre-existing medical condition) – 0.384 (two or more pre-existing medical conditions) + 0.016*systolic blood pressure + 0.797 (oxygen saturation < 94% on air) – 0.002*platelet count + 0.126*log(alanine amino transferase) + 0.605*log(serum urea)^2 – 0.144*log(serum urea)^3 + 0.265*log(serum creatinine) + 0.080*log(protein creatinine ratio) + 0.176 (baseline treatment with any antihypertensive) + 1.066 (baseline treatment with magnesium sulfate)) § *$S_0(t)$ – baseline survival adjusted for optimism at time t S_0 (48 hrs) = 0.99142, S_0 (72 hrs) = 0.98542, S_0 (1 week) = 0.96492, S_0 (1 month) = 0.87377* **b. Overall risk by postnatal discharge using the logistic model (PREP-L)** Probability (maternal adverse outcome) = exp(X)/(1 + exp(X)), Where X = – 1.507– 0.020*maternal age + 12.052*(log (gestational age))^3 – 39.90241) – 7.930*((log (gestational age))^3*log(log (gestational age) – 49.08188) – 0.330 (if one pre-existing medical condition) – 0.579 (if two or more pre-existing medical conditions) + 0.146*log (urine protein creatinine ratio) – 0.951*(log (serum urea)$^{-1}$) – 0.004*platelet count + 0.024*systolic blood pressure + 0.409 (baseline treatment with antihypertensive) + 1.252 (baseline treatment with magnesium sulfate) *Predictor value is 1 when present and 0 when absent*

Problem definition → Data collection → Development → Validation & update → Impact assessment → Clinical adoption



Name	Conversion	Option (value)
Maternal age	Full range	16 - 45 Years
Gestational age (weeks)	Full range	20 - 34 Weeks
Gestational age (days)	None	0 - 6 days
Exaggerated tendon reflexes	None	No (0) Yes (0.122)
Pre-existing medical condition	None	0 (0) 1 (-0.169) ≥2 (-0.385)
Protein to creatinine ratio (PCR)	Full range	0 - 5000 mg/mmol
Serum urea concentration	Full range	0 - 25 mmol/L
Platelet count	Full range	50 - 400 x10^9/L
Systolic blood pressure	Full range	50 - 250 mmHg
Treatment with antihypertensive drugs	None	No (0) Yes (0.176)
Treatment with magnesium sulphate (MgSO4)	None	No (0) Yes (1.066)

Box 1: Full PREP prognostic models to calculate the risk of adverse maternal outcomes in women with early onset pre-eclampsia

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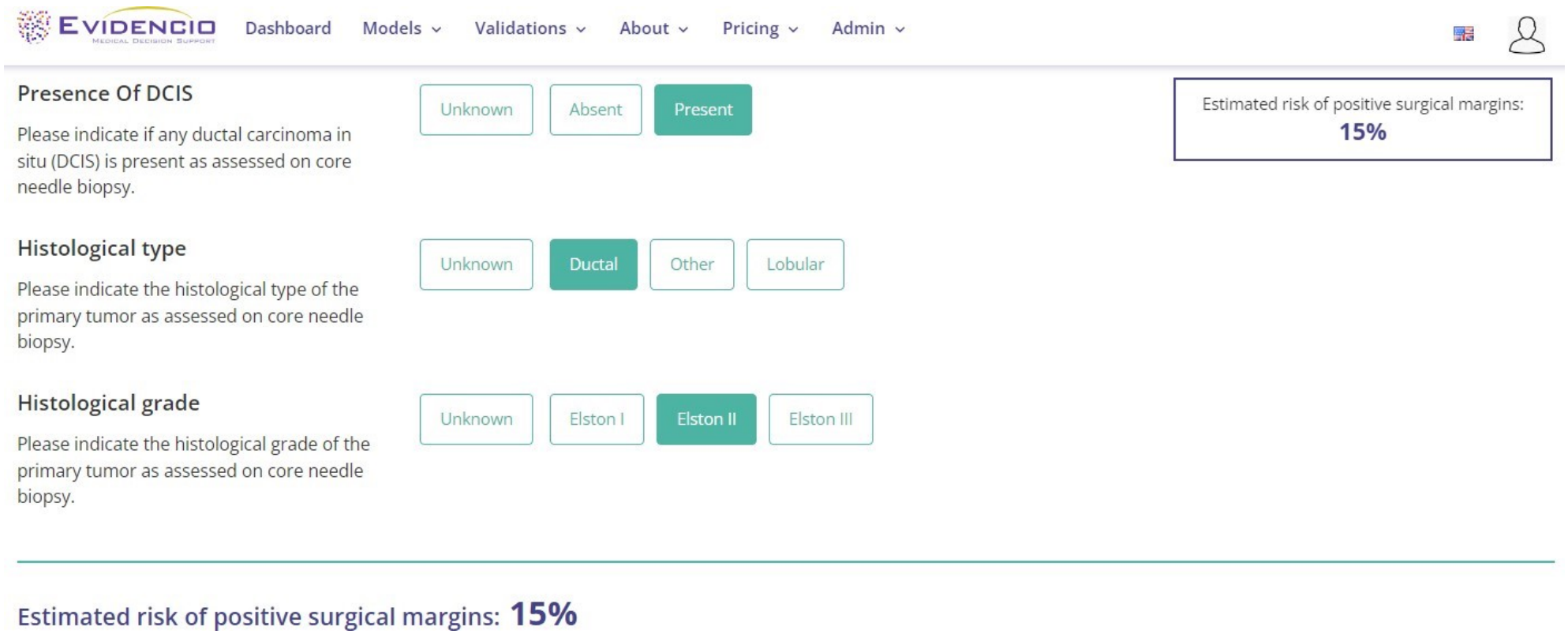
https://www.evidencio.com/models/show/1043

Problem definition | Data collection | Development | **Validation & update** | Impact assessment | Clinical adoption



Are the risk predictions accurate?

Problem definition | Data collection | Development | **Validation & update** | Impact assessment | Clinical adoption

Show validation data as:

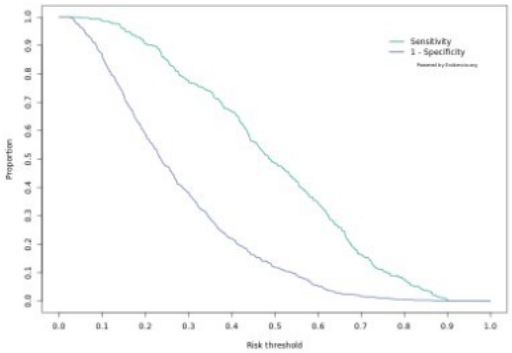
Validation Values | **Model Labels** | Clear data

	Preoperative M...	Microcalcifica...	Preoperative N...	Preoperative T...	Density	Palpability	Suspicion of m...	Estrogen recep...	Presence Of DC...	Histological t...	Histological g...	Outcome	Probability
1	No	Present	Negati...	T2	50-75%	Palpa...	Yes	Positive	Present	Ductal	Elston ...	Positive	0.688(
2	Yes	Absent	Negati...	T1	0-25%	Non-P...	No	Negati...	Absent	Other	Elston ...	Negati...	0.045
3	No	Present	Positive	T1	0-25%	Non-P...	No	Negati...	Absent	Ductal	Elston ...	Negati...	0.156
4	Yes	Present	Negati...	T1	50-75%	Non-P...	No	Positive	Absent	Ductal	Elston II	Positive	0.100(
5	Yes	Present	Positive	T1	50-75%	Palpa...	No	Negati...	Present	Ductal	Elston II	Negati...	0.180
6	Yes	Absent	Positive	T1	0-25%	Palpa...	No	Negati...	Absent	Other	Elston II	Negati...	0.036
7	No	Present	Positive	T1	50-75%	Non-P...	No	Positive	Absent	Ductal	Elston ...	Negati...	0.331
8	Yes	Absent	Positive	T1	25-50%	Non-P...	No	Positive	Present	Ductal	Elston II	Negati...	0.280(
9	Yes	Absent	Negati...	T1	50-75%	Palpa...	No	Positive	Absent	Ductal	Elston ...	Negati...	0.077
10	Yes	Absent	Negati...	T1	50-75%	Non-P...	Yes	Negati...	Present	Lobular	Elston I	Positive	0.553
11	No	Present	Positive	T2	75-10...	Palpa...	Yes	Positive	Absent	Lobular	Elston II	Positive	0.751
12	Yes	Present	Negati...	T1	50-75%	Non-P...	No	Positive	Present	Ductal	Elston II	Negati...	0.256
13	Yes	Absent	Positive	T2	50-75%	Non-P...	No	Negati...	Absent	Ductal	Elston ...	Negati...	0.139
14	Yes	Present	Negati...	T2	50-75%	Non-P...	No	Positive	Present	Ductal	Elston II	Negati...	0.314
15	No	Absent	Negati...	T2	0-25%	Non-P...	No	Positive	Absent	Other	Elston I	Positive	0.124
16	No	Present	Negati...	T1	25-50%	Non-P...	Yes	Positive	Absent	Lobular	Elston II	Positive	0.571
17	Yes	Present	Positive	T1	50-75%	Non-P...	No	Positive	Present	Ductal	Elston ...	Positive	0.461
18	Yes	Absent	Negati...	T2	75-10...	Palpa...	Yes	Positive	Present	Other	Elston I	Positive	0.452
19	No	Absent	Positive	T1	25-50%	Palpa...	No	Negati...	Present	Other	Elston I	Negati...	0.204

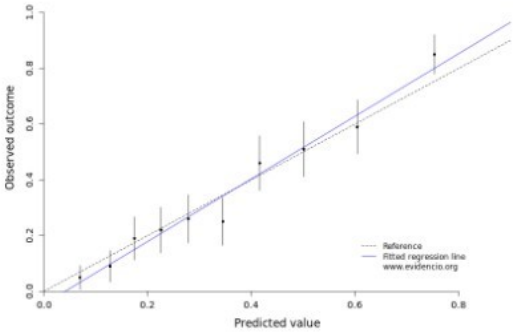
Results

Rows included	1000	Slope	1.123
C-index	0.792 | 95% CI: 0.7625 - 0.8204 **ROC**	Intercept	-0.046
Brier score	0.172	Hosmer-Lemeshow GOF	0.153
Scaled Brier score	0.24		

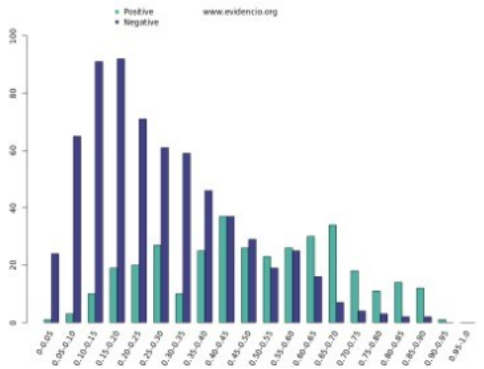
Classification plot



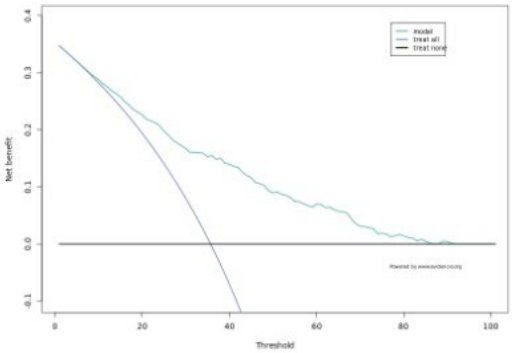
Calibration plot



Histogram



Decision curve



Problem definition | Data collection | Development | Validation & update | **Impact assessment** | Clinical adoption

bsi. ISO 13485 Medical Devices Quality Management

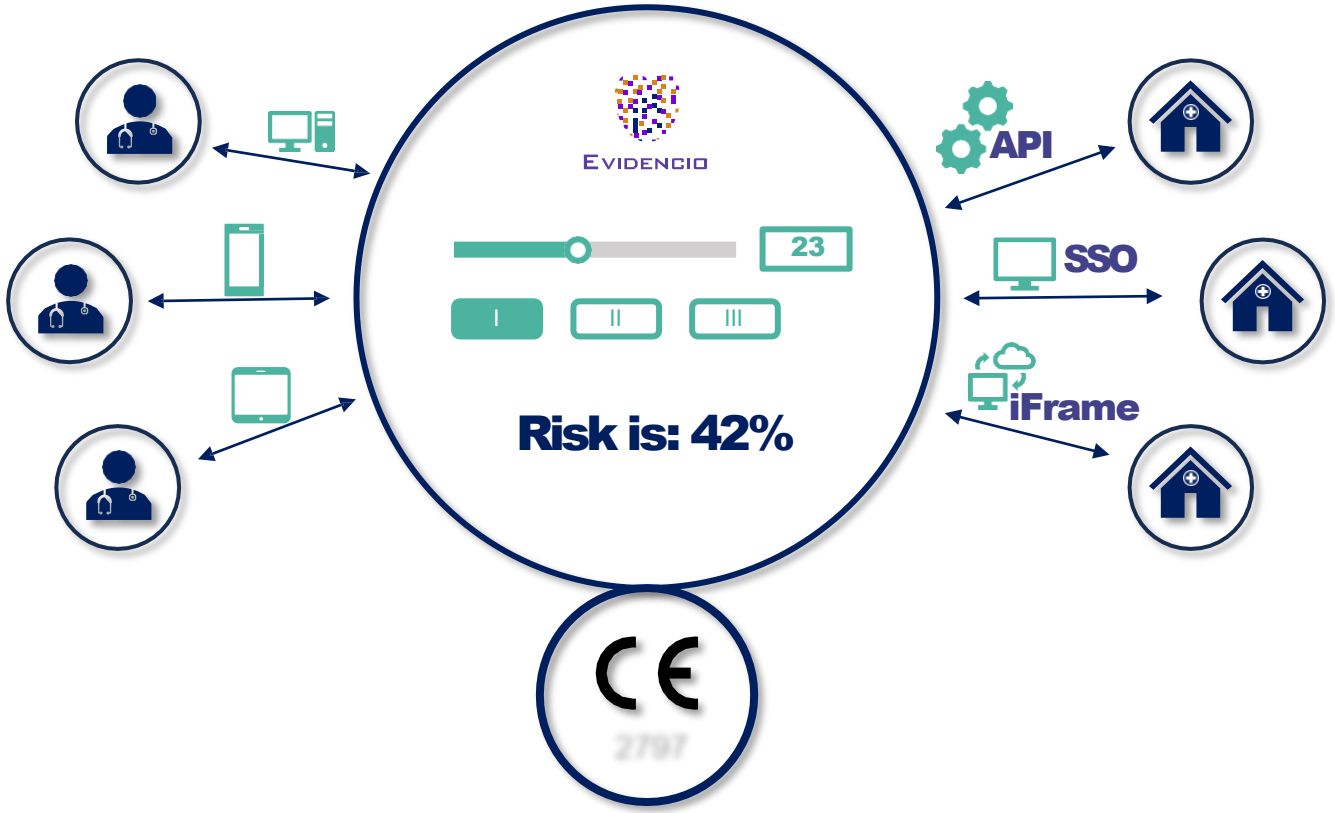
kiwa gecertificeerd NEN 7510 INFORMATIEVOORZIENING IN DE ZORG

kiwa certified ISO/IEC 27001

Use the Evidencio platform to assess the impact of your prediction model

Clinical prediction algorithm lifecycle

Problem definition → Data collection → Development → Validation & update → Impact assessment → **Clinical adoption**



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kiwa certified ISO/IEC 27001

Evidencio can act as a legal manufacturer for your medical device software

Involvement in the prediction model lifecycle

EVIDENCIO

Post market surveillance & clinical follow-up

EVIDENCIO

Creating an online tool

EVIDENCIO

Using the validation module

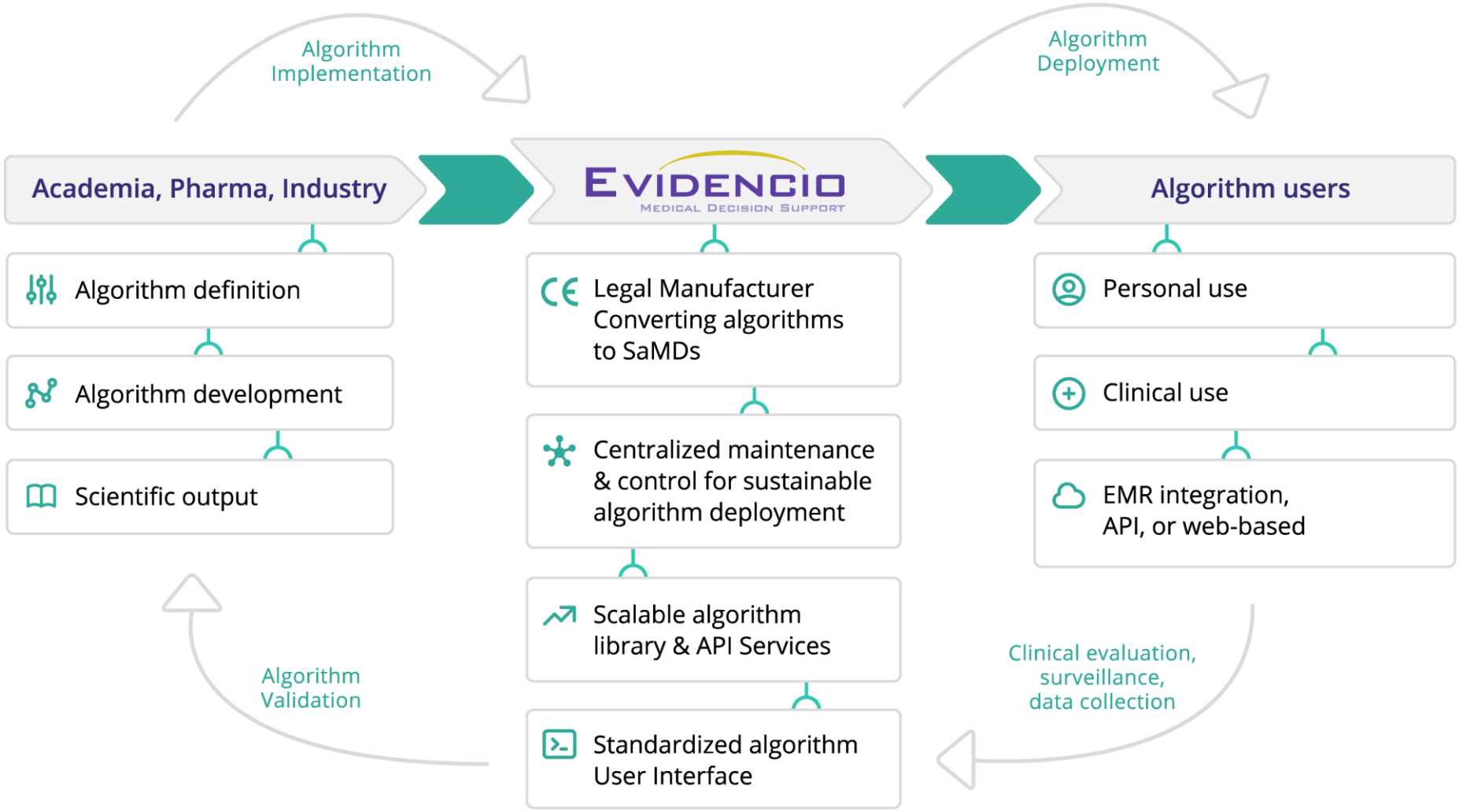
EVIDENCIO

Facilitating clinical trials with compliant software

EVIDENCIO

Legal manufacturer of the medical device software

Evidencio's Algorithm library



A showcase example of the collaboration with the University of Twente:

The NABOR project

INFLUENCE 2.0 -> INFLUENCE 3.0

Breast Cancer Research and Treatment (2021) 189:817–826
https://doi.org/10.1007/s10549-021-06335-z

EPIDEMIOLOGY

Improved risk estimation of locoregional recurrence, secondary contralateral tumors and distant metastases in early breast cancer: the INFLUENCE 2.0 model

Vinzenz Völkel[1] · Tom A. Hueting[2,3] · Teresa Draeger[1] · Marissa C. van Maaren[3,4] · Linda de Munck[4] · Luc J. A. Strobbe[5] · Gabe S. Sonke[6] · Marjanka K. Schmidt[7] · Marjan van Hezewijk[8] · Catharina G. M. Groothuis-Oudshoorn[3] · Sabine Siesling[3,4]

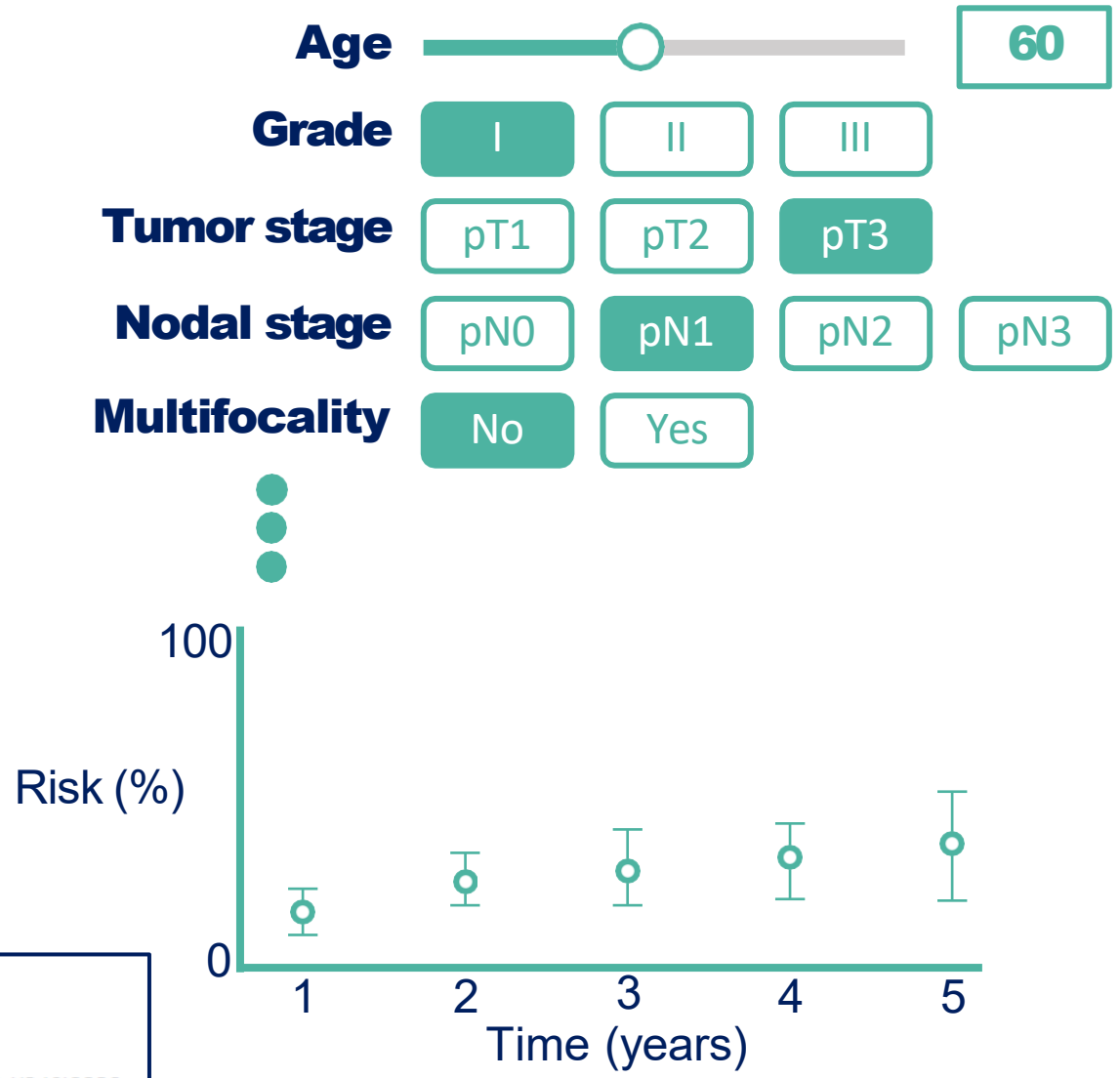
the risk for DM. Table 3 gives an overview of the underlying coefficients.

Online calculator

The first DM based on the set predictions es; an easy-to-use online risk calculator is a https://www.evidencio.com/models/show/2238. lculator estimates the risks and the 95% conf in the 200 bootstrapped

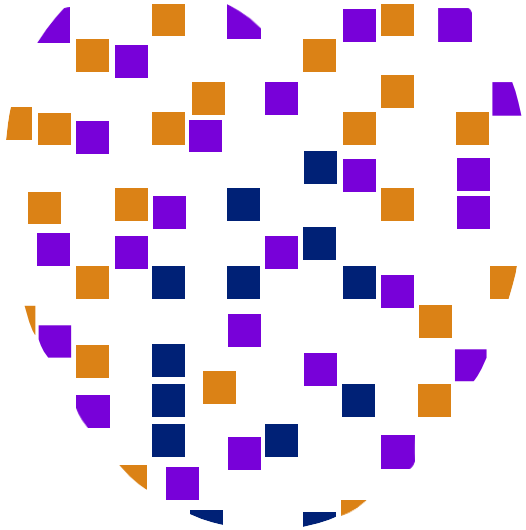
Comparison to the original INFLUENCE nomogram and other related prediction models

Compared to the original INFLUENCE nomogram, the INFLUENCE 2.0 model comes with a variety of updates leading to improved flexibility and a broader application range regarding predictable events. Concerning clinical decision-making, discrimination is arguably the most relant indicator for model performance. The AUC of the ve annual prediction models of the original INFLUENCE nomogram which is exclusively concentrating on the endpoint LRR starts with 0.84 for the first year and decreases to



LOT V-2.0-2238.21.05.14 CE

UDI (01)08720299526440(8012)v2.0(4326)210514(240)2238



EVIDENCIO

Dr. Tom Hueting
01 November 2023
TECHMED Event

Tom@evidencio.com