



AI_PREMie

PHUSEConnect Belfast

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16th November 2022



Problem: Preeclampsia

Preeclampsia is a hypertensive disorder that affects 1 in 12 pregnancies



Problem: Preeclampsia

World Pre-eclampsia Day 2022 



Every **7 minutes** a woman loses her life due to pre-eclampsia (PE) associated complications

Globally, **76,000** women die each year from PE

500,000 babies die each year from PE through premature delivery - the only cure for the condition

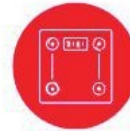
Symptoms of Pre-Eclampsia



Severe headache that won't go away even with medication



Swelling of the face and hands



Weight gain of more than 2 pounds / 1 kg in one week



Difficulty breathing, gasping, or panting



Nausea after mid-pregnancy



Changes in vision (spots, light flashes, or vision loss)



Upper right belly pain / shoulder pain

AI
PREMIE 

AI_PREMie Team

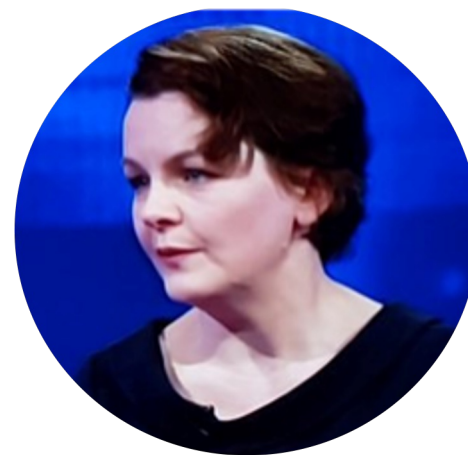
January 2020



Prof Fionnuala Ní Áinle



Prof Patricia Maguire



Prof Mary Higgins





Clinical



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Health Economics



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Lab/Research/Data Collection



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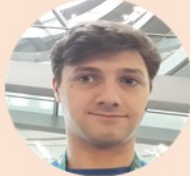
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Ms Mandy Daly

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Mr Edward Simons



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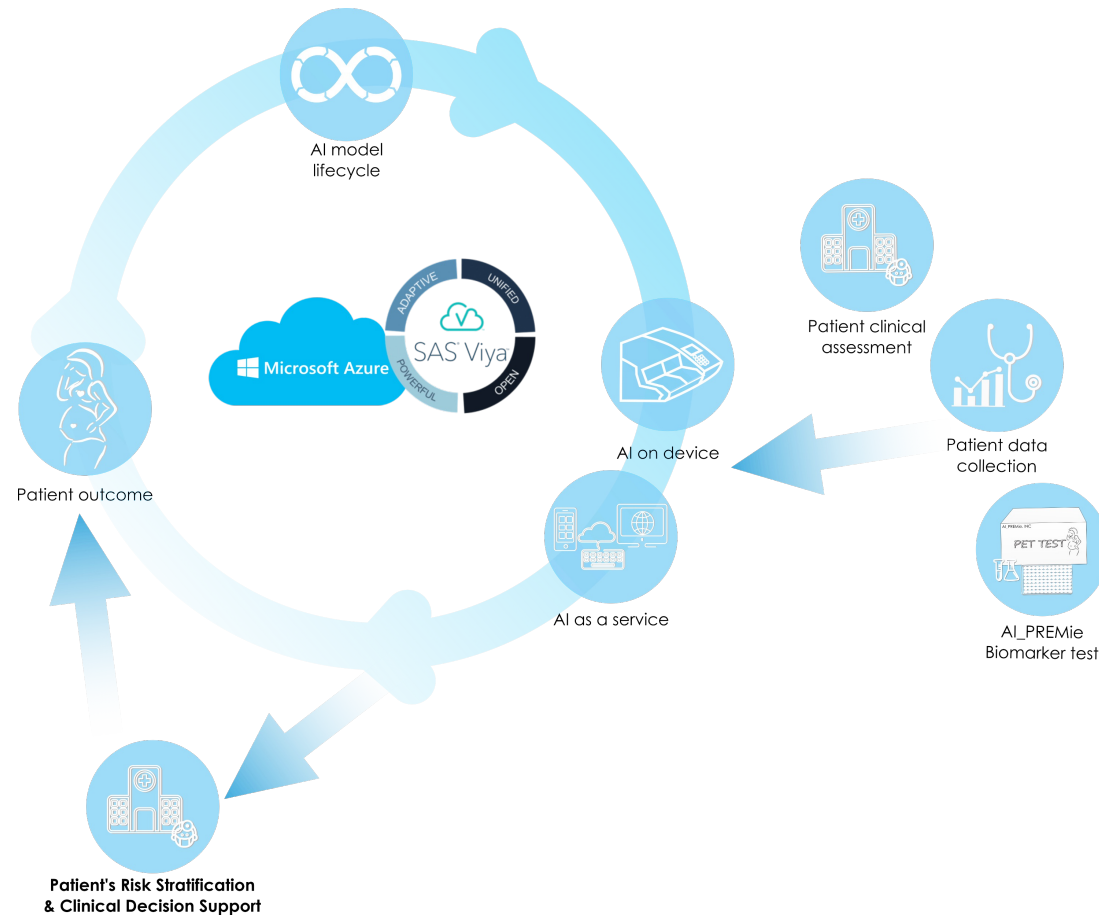
The National Maternity Hospital
Vita Gloriosa Vita – Life Glorious Life



THE POWER TO KNOW.

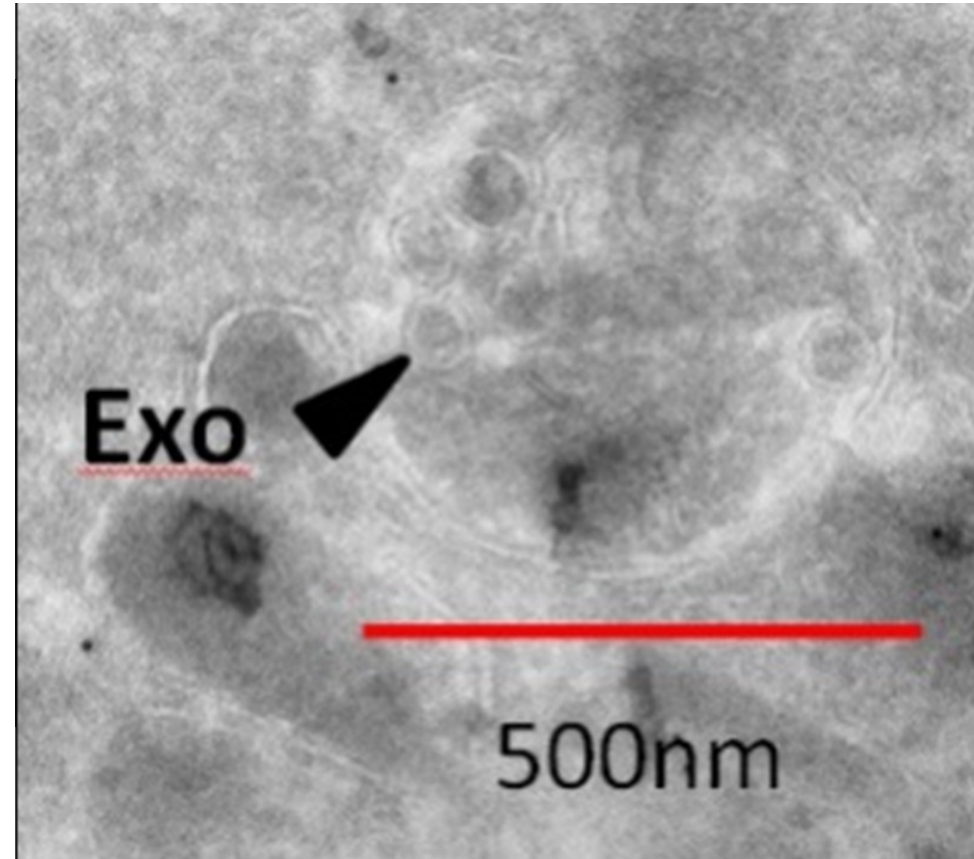


AI_PREMie: A unified biosignature



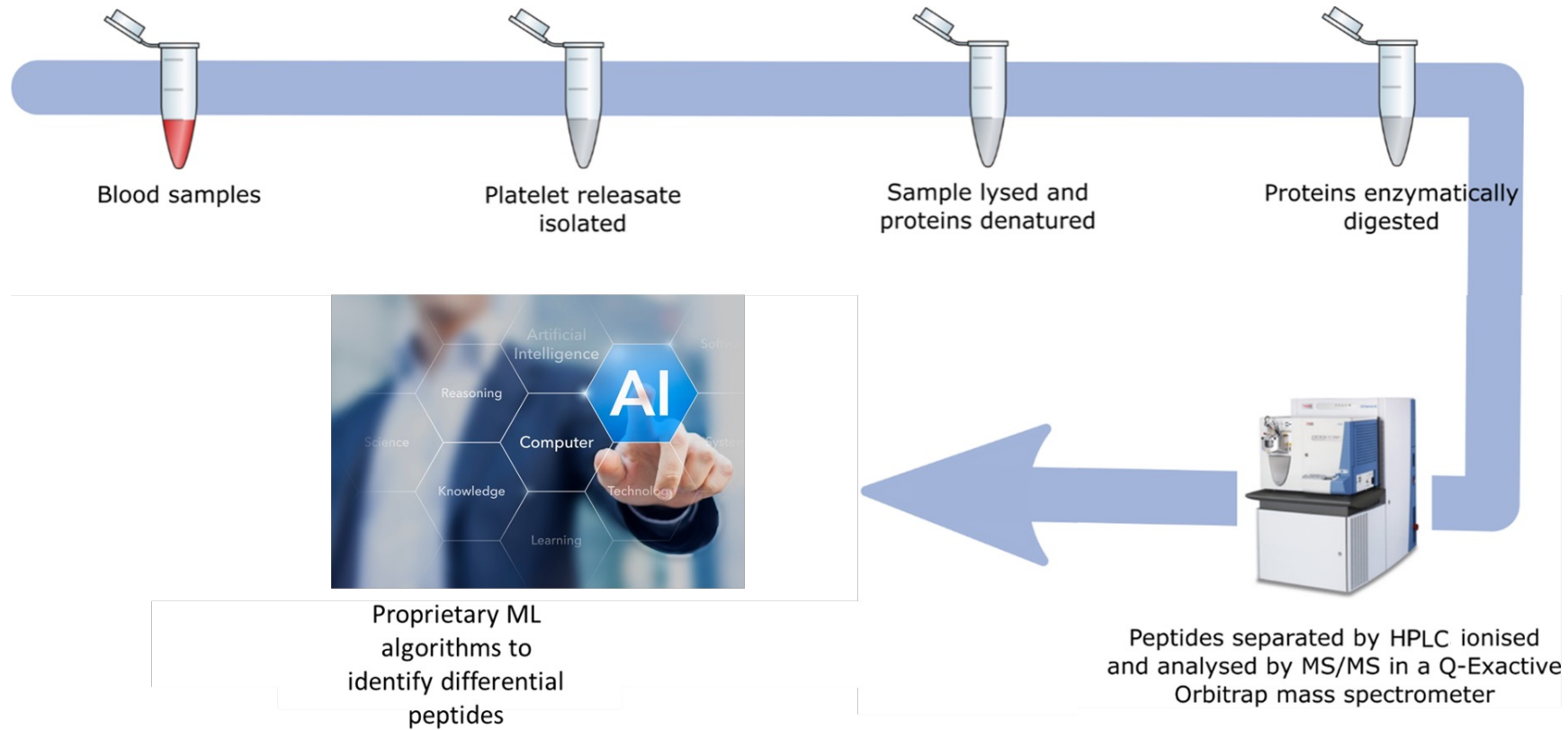
Effective, Efficient Clinical Decision Making

Platelets store the secrets of health & disease



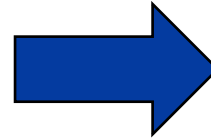
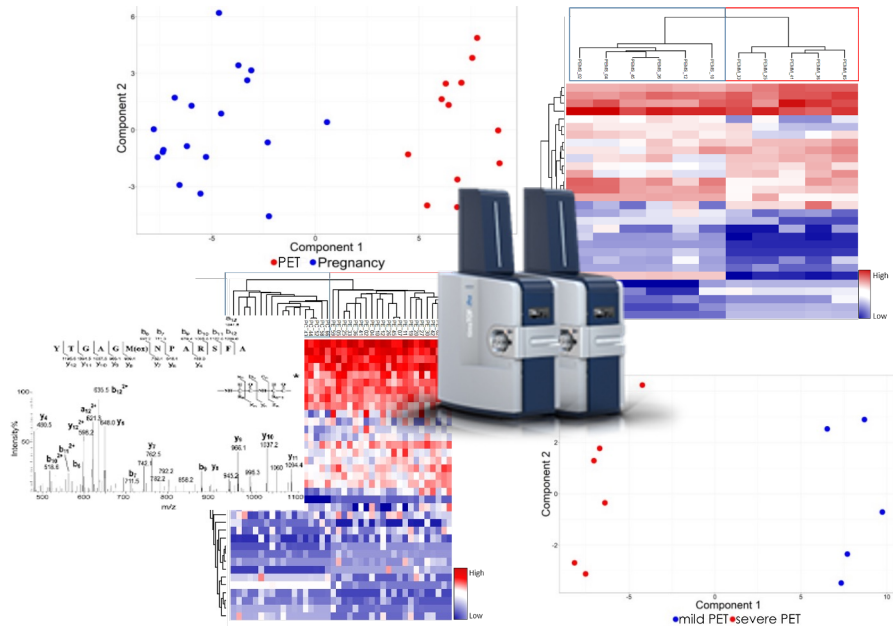
Sequester and store important diagnostic information

Finding those secrets of disease



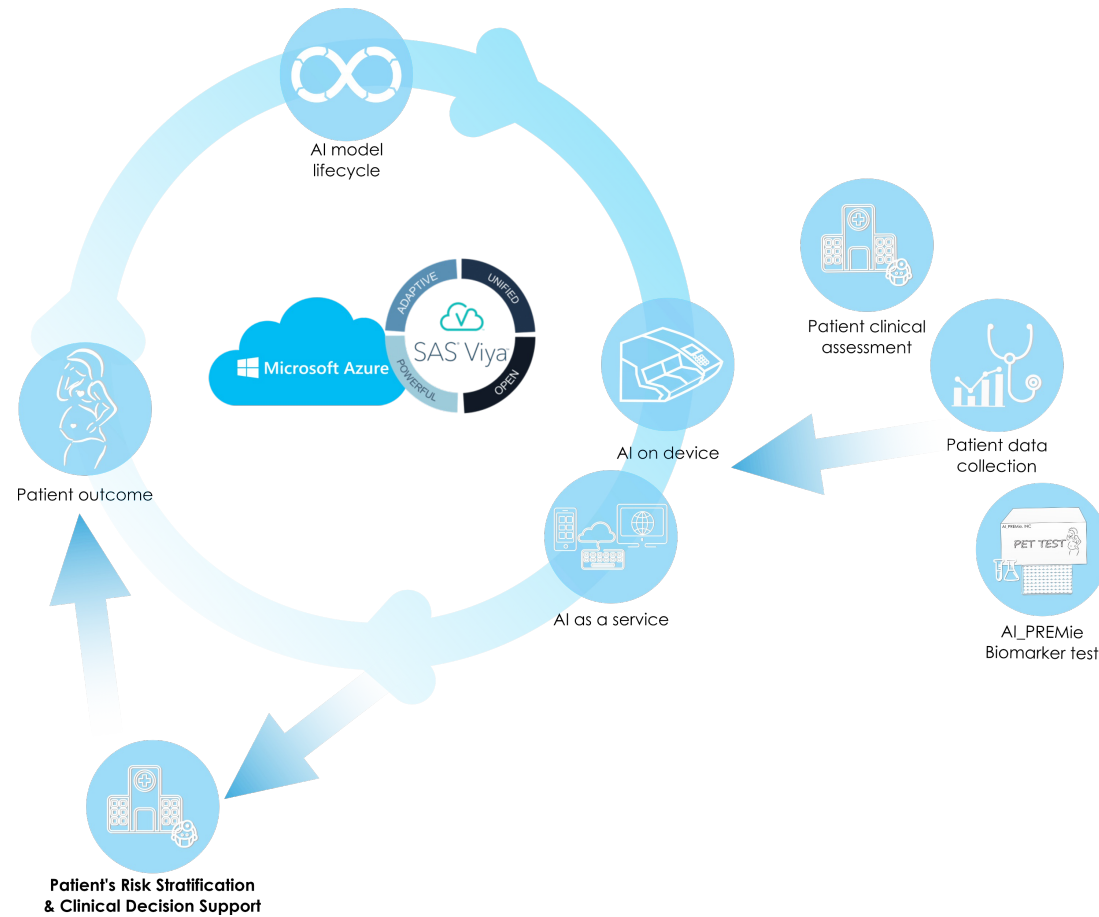
PALADIN™ – *Platelet-based Diagnostics*

Diagnostics underlying AI_PREMie



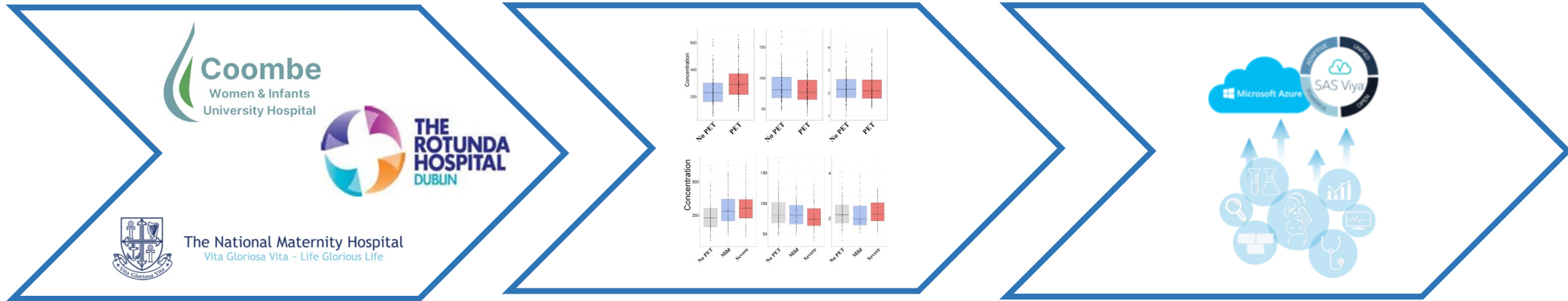
❓ Uncovered multi-award winning patented diagnostics from the blood of sick, expectant mothers

AI_PREMie: A unified biosignature



Effective, Efficient Clinical Decision Making

AI_PREMie study design



AI
PREMie

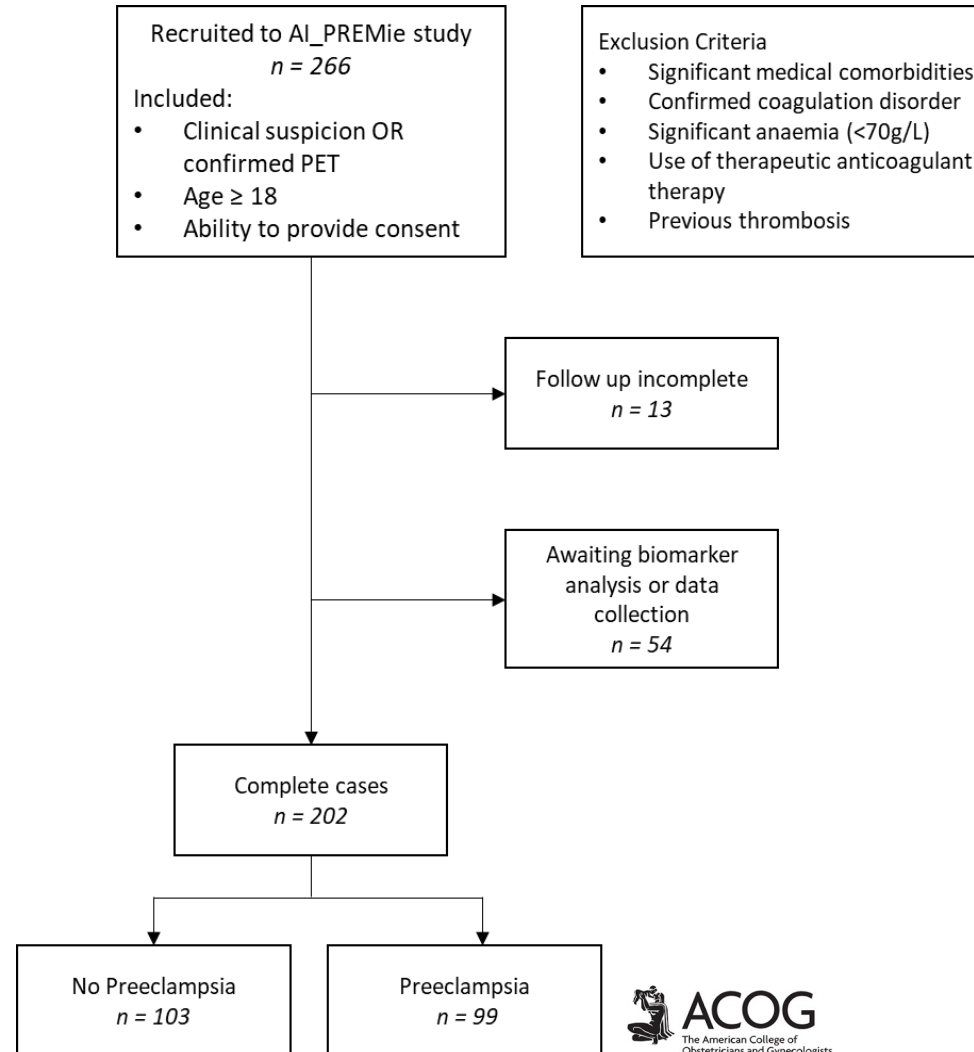
**Ethical approval granted
from 3 tertiary maternity
hospitals in Dublin
(capturing 50% of all
births in Ireland)**

**250 patient recruited and
quantification of
AI_PREMie biomarkers in
plasma**

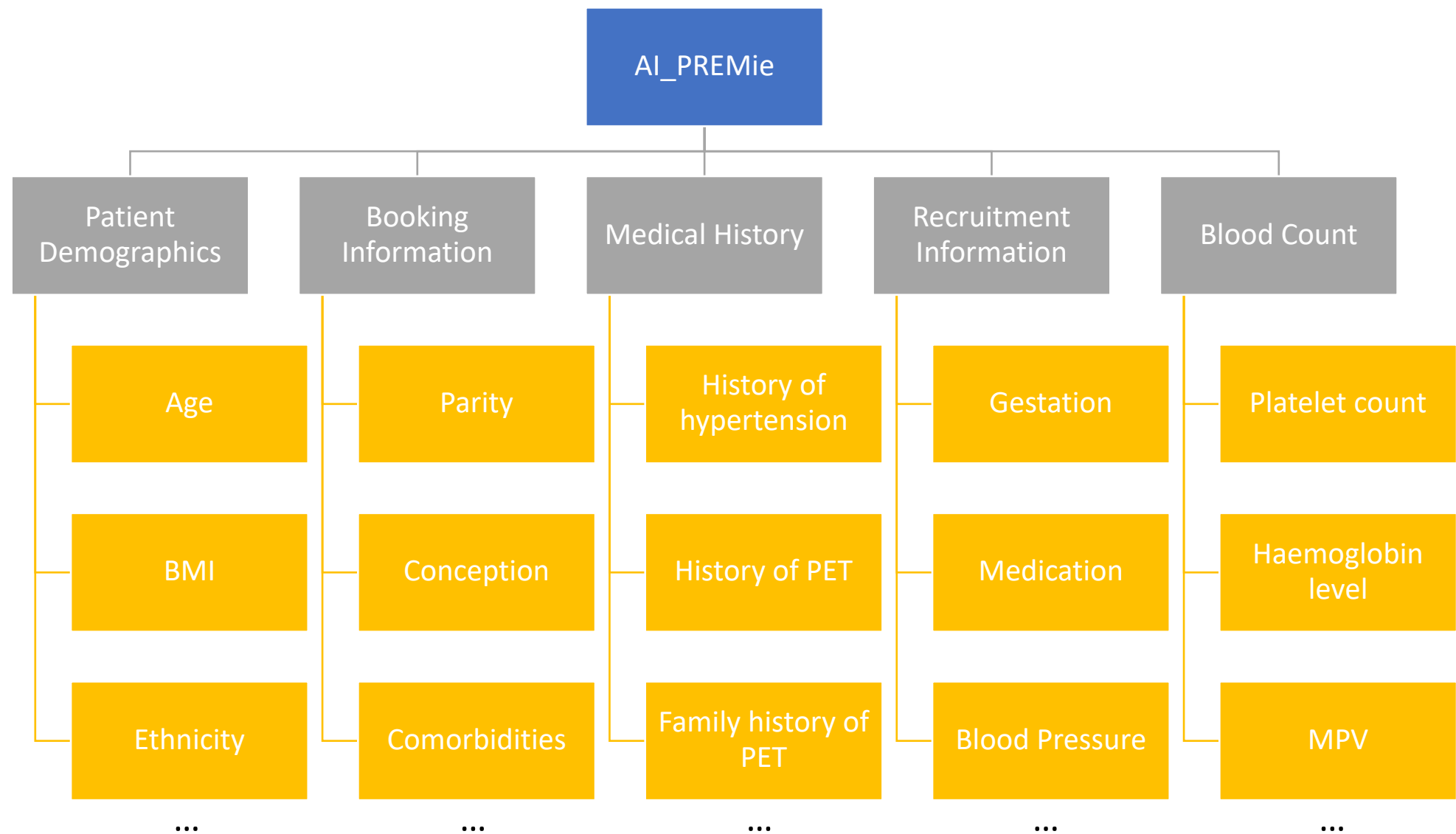
**Generation of prototype
ML scoring model for
AI_PREMie**

Prototype test covering 50% of all the births in Ireland

AI_PREMie Study Population



AI_PREMie Dataset



AI_PREMie Dataset

- On demographics alone, difficult to separate no pre-eclampsia versus pre-eclampsia.
- Ethnicity is a known risk factor in pre-eclampsia: rate in Ireland 4.6%¹, rate in Black American women 11%²

Characteristics	No Preeclampsia (n = 103)	Preeclampsia (n = 99)	p Value
Preeclampsia Severity, n (%)			-
Mild	-	56 (56.6%)	
Severe	-	43 (43.4%)	
Age (years ± SD [IQR])	33 ± 5 [31-36]	33 ± 7 [27-37]	.672
BMI (kg/m ² ± SD [IQR])	29.89 ± 6.84 [25.64-33.35]	29.63 ± 6.58 [25.11-32]	.691
SBP (mmHg ± SD [IQR])	136 ± 14 [126-145]	138 ± 15 [129-147]	.587
DBP (mmHg ± SD [IQR])	83 ± 10 [76-90]	86 ± 10 [80-92]	.137
Gravida (± SD)	2 ± 2	2 ± 1	.228
Parity (± SD)	1 ± 1	1 ± 1	.183
Conception, n (%)			.356
Missing	6 (5.8%)	7 (7.1%)	
IUI	0 (0%)	2 (2%)	
IVF	5 (4.9%)	8 (8.1%)	
OI	0 (0%)	1 (1%)	
Spontaneous	92 (89.3%)	81 (81.8%)	
Multiple Gestation, n (%)			.765
Singleton	99 (96.1%)	95 (96%)	
DCDA/MCDA	4 (3.9%)	4 (4%)	
Smoking, n (%)			.779
Missing	5 (4.9%)	5 (5.1%)	
Daily throughout pregnancy	3 (2.9%)	6 (6.1%)	
Occasionally throughout pregnancy	3 (2.9%)	4 (4%)	
Ex-smoker pre-pregnancy	13 (12.6%)	8 (8.1%)	
Gave up during pregnancy	3 (2.9%)	2 (2%)	
Never smoked	76 (73.8%)	74 (74.7%)	
Alcohol, n (%)			.093
Missing	8 (7.8%)	9 (9.1%)	
Less than once per month	0 (0%)	1 (1%)	
Medium risk	0 (0%)	1 (1%)	
Never drink	26 (25.2%)	39 (39.4%)	
No alcohol since pregnancy result	69 (67%)	49 (49.5%)	
Ethnicity, n (%)			.035
Missing	2 (1.9%)	2 (2%)	
Asian (or Irish Asian) any other Asian background	1 (1%)	6 (6.1%)	
Asian (or Irish Asian) Chinese background	1 (1%)	2 (2%)	
Black (or Black Irish African background)	4 (3.9%)	2 (2%)	
Black (or Black Irish) any other background	0 (0%)	1 (1%)	
Mixed background	0 (0%)	1 (1%)	
White (any other White background)	26 (25.2%)	8 (8.1%)	
White Irish	67 (65%)	74 (74.7%)	
White Irish Traveller	2 (1.9%)	3 (3%)	
Comorbidities, n (%)			
Diabetes Type 1	2 (1.9%)	4 (4%)	.380
Diabetes Type 2	0 (0%)	2 (2%)	.147
Gestational Diabetes	21 (20.4%)	15 (15.2%)	.372
Kidney Disease	0 (0%)	2 (2%)	.147
Hyperthyroidism	1 (1%)	1 (1%)	.978
Heart Condition	6 (5.8%)	3 (3%)	.336
Obesity	45 (43.7%)	40 (40.4%)	.618
Autoimmune	2 (1.9%)	4 (4%)	.356

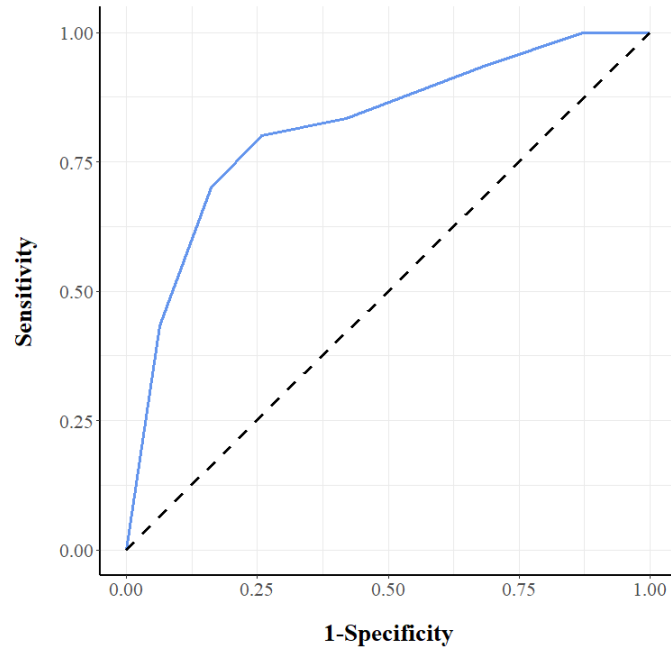
Values denote n (%) or mean ± standard deviation [IQR]. SBP, systolic blood pressure; DBP, diastolic blood pressure; DCDA/MCDA, dichorionic/monochorionic diamniotic twins; IUI, intrauterine insemination; IVF, *In vitro* fertilization; OI, Ovulation induction.



¹Corrigan, L., *Preg. Hypertension*. 2021

²Boakye E, *JAMA Netw Open*. 2021

AI_PREMie: A Decision Support Tool for Pre-Eclampsia

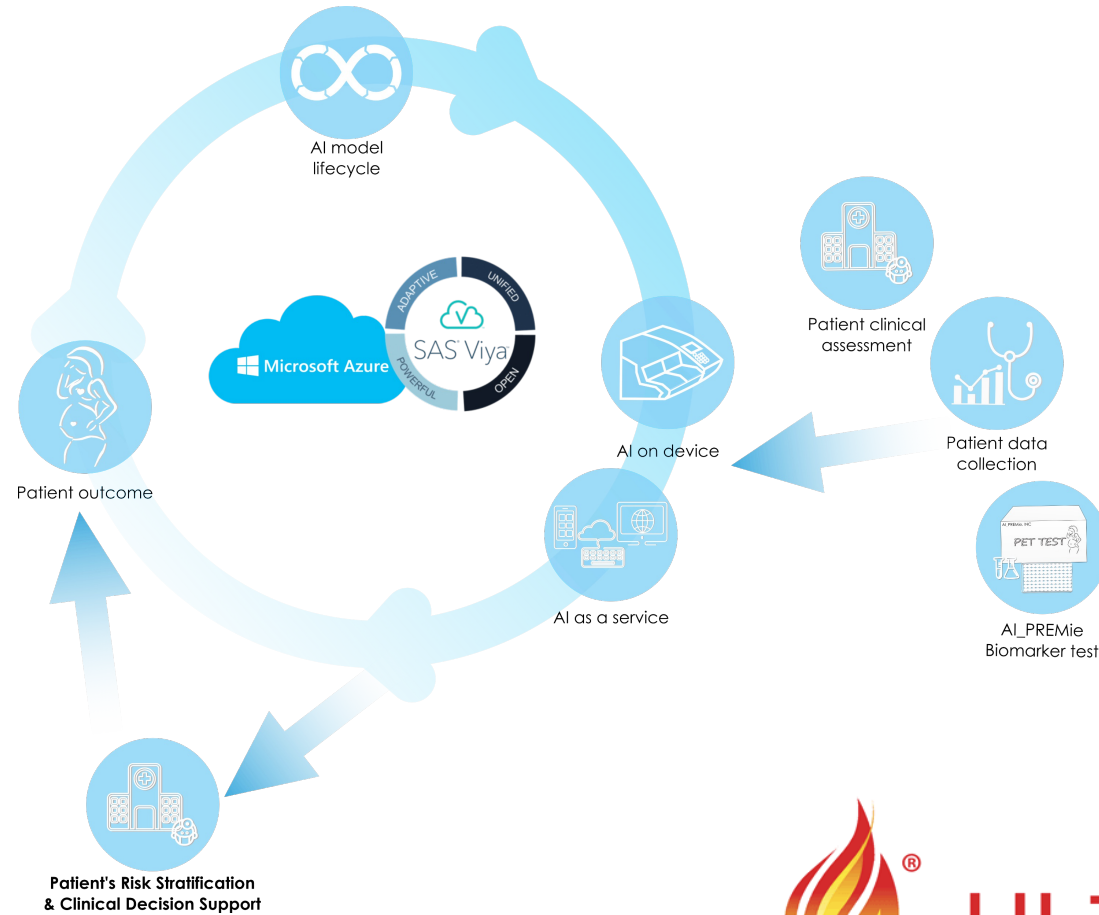


Measure	Value [95% CI]
AUROC	0.813 [0.704-0.877]
Sensitivity	0.808 [0.666-0.949]
Specificity	0.743 [0.589-0.897]
Accuracy	0.774 [0.668-0.880]



The current prototype champion model is gradient boosting with a misclassification rate of 23%.

AI_PREMie: A unified biosignature



Effective, Efficient Clinical Decision Making



AI Healthcare Hub

UCD INSTITUTE FOR DISCOVERY



UCD Conway SPHERE

UCD Institute for Discovery

SAS have been working with UCD and the AI healthcare hub over the past few years

The interdisciplinary hub brings together, biomedical and data science researchers, clinical practitioners, health bodies, SAS and Microsoft among others

With the ambition to share expertise to solve difficult problems

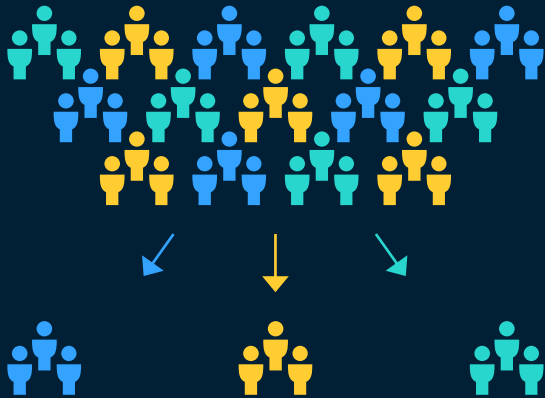


What can be achieved

PRECISION HEALTH

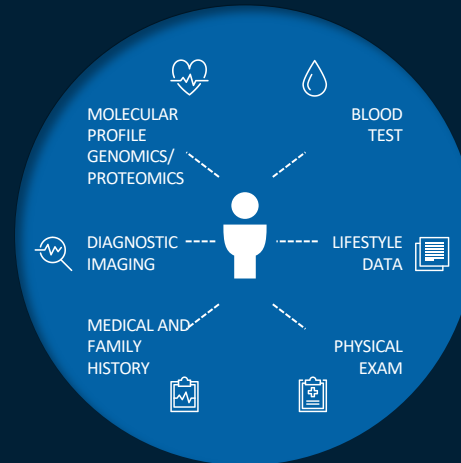
PRECISION MEDICINE

PRECISION PREVENTION



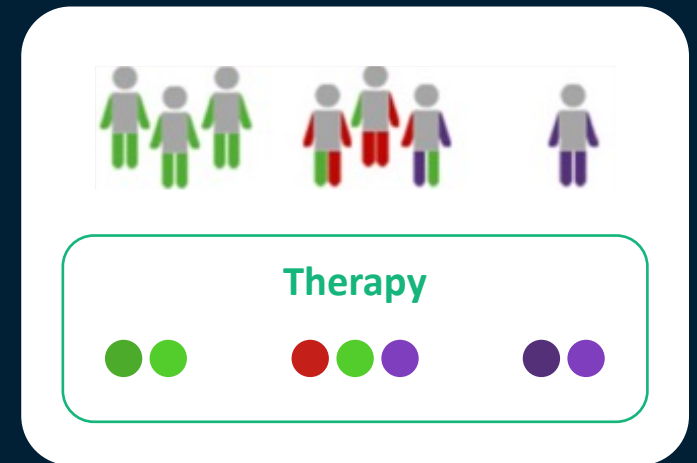
Early detection of patients at risk,
Improve preventive measures
(individual/collective)

PRECISION DIAGNOSTICS



Accurate disease diagnosis
enabling individualized
treatment strategy

PRECISION TREATMENT

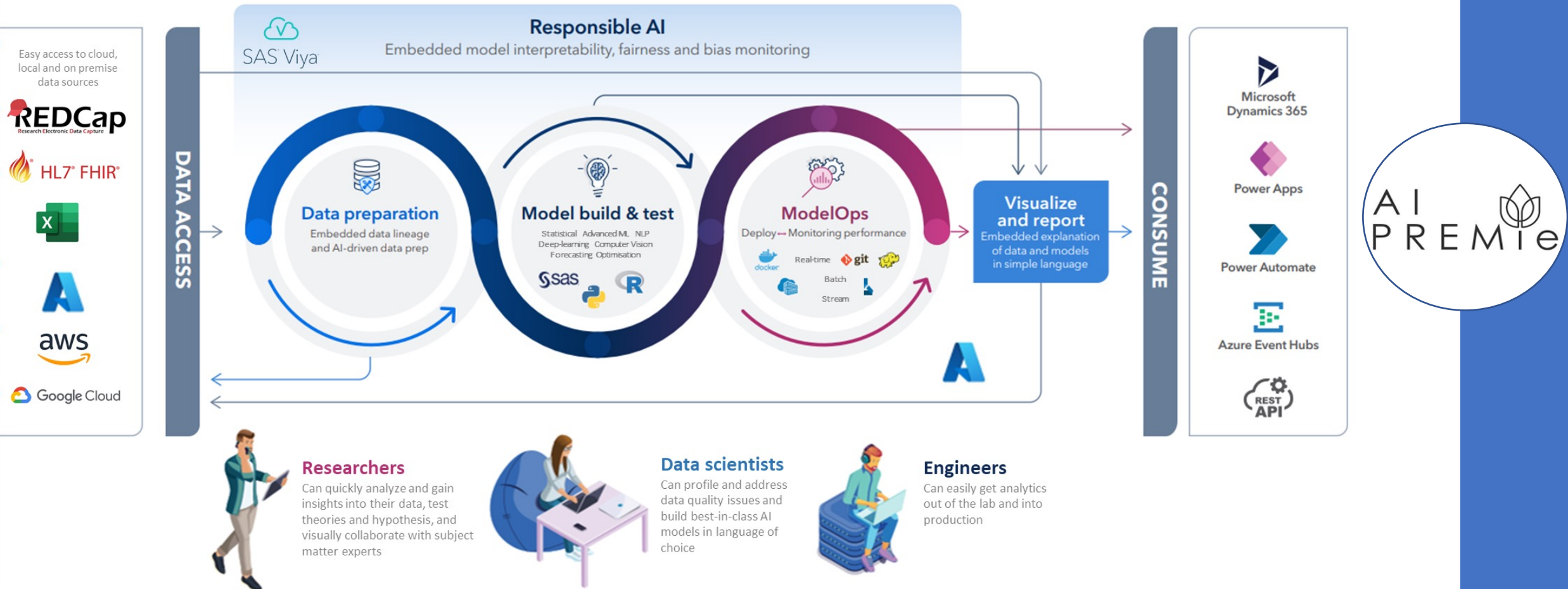


Improved outcomes through
targeted treatments and
reduced side effects

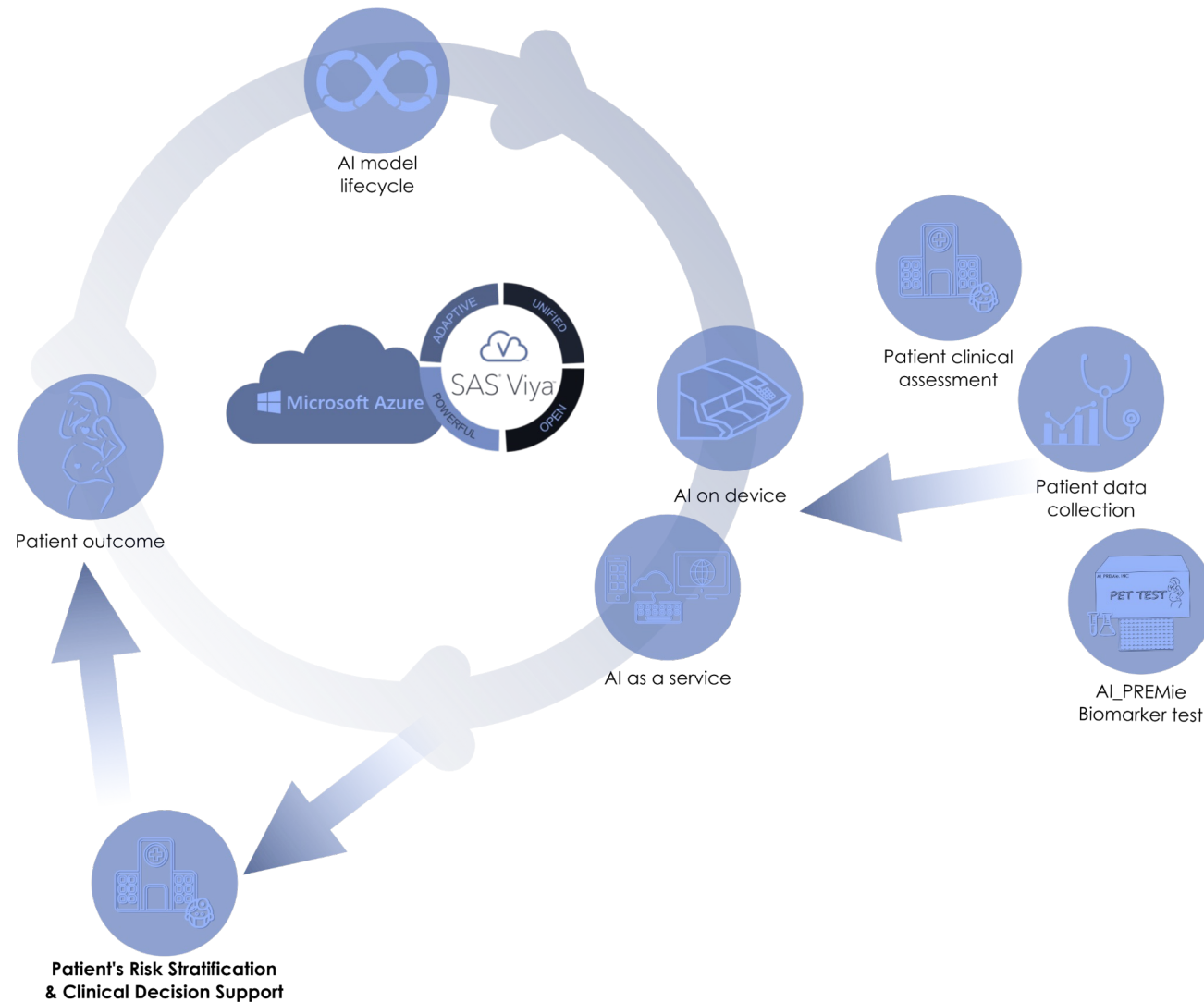
A shared space for research and development of AI and machine learning



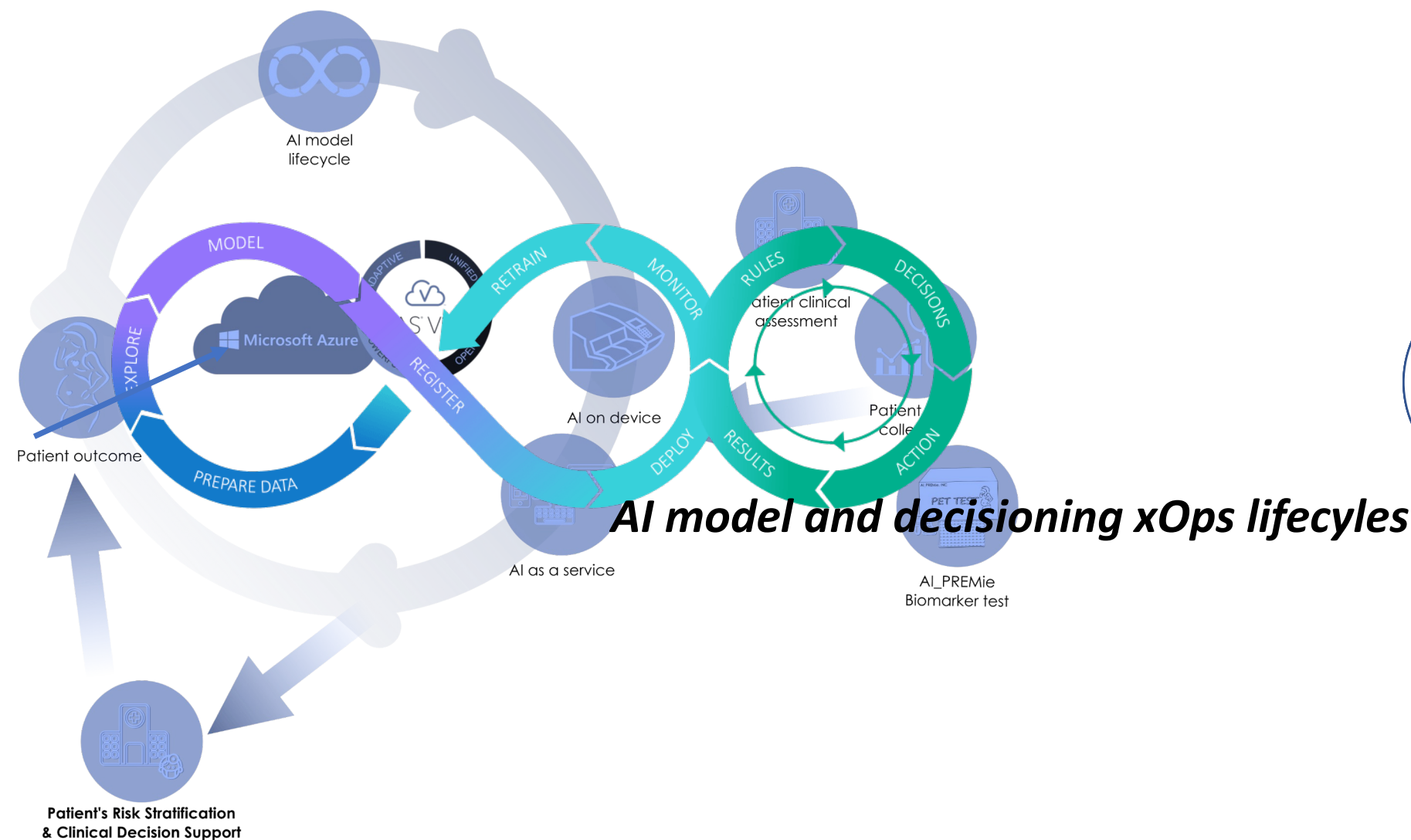
Robust data prep. Powerful ML. Streamlined deployment. Faster results.



Bringing AI Premie to the bedside



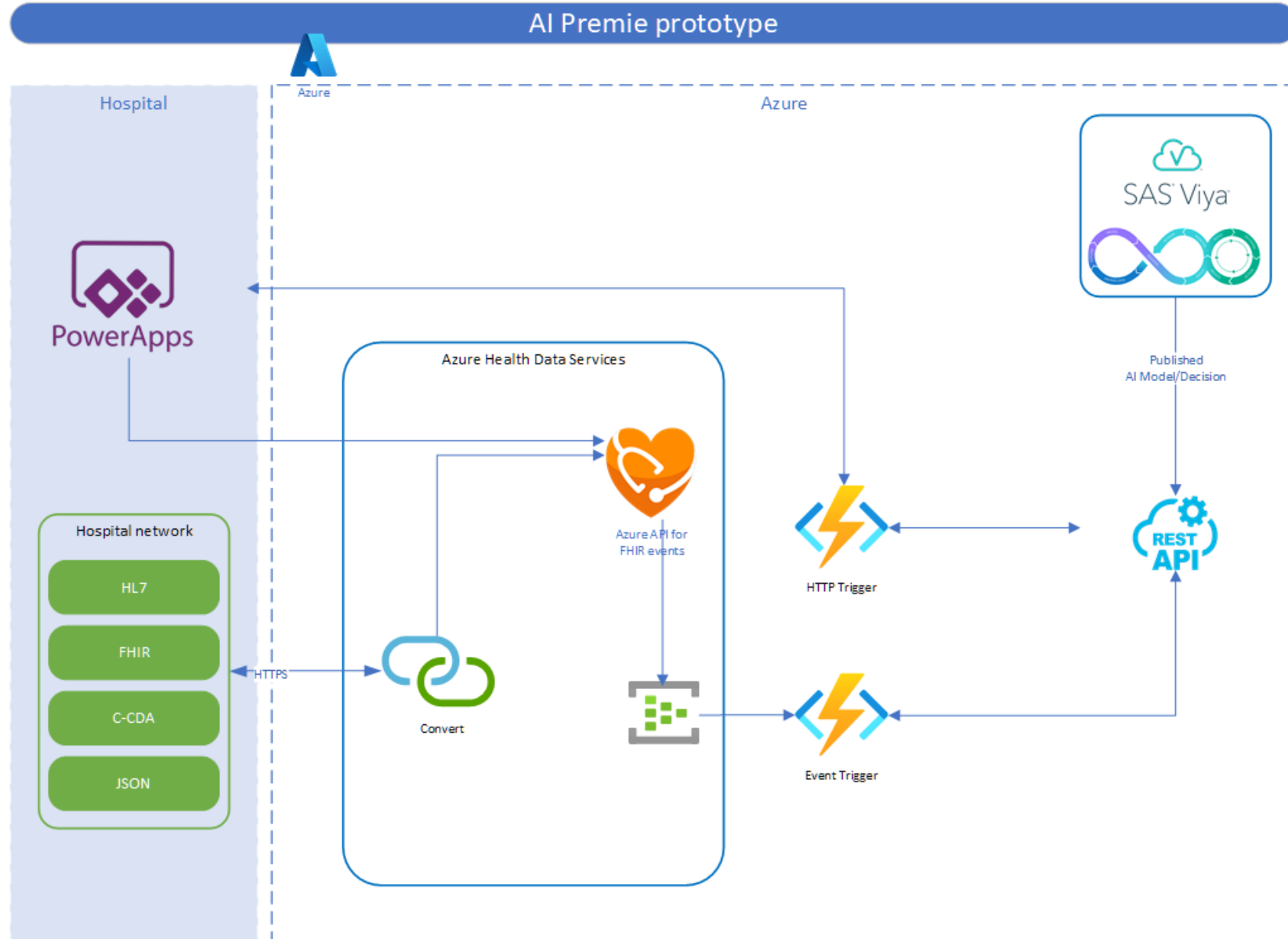
The analytics lifecycle



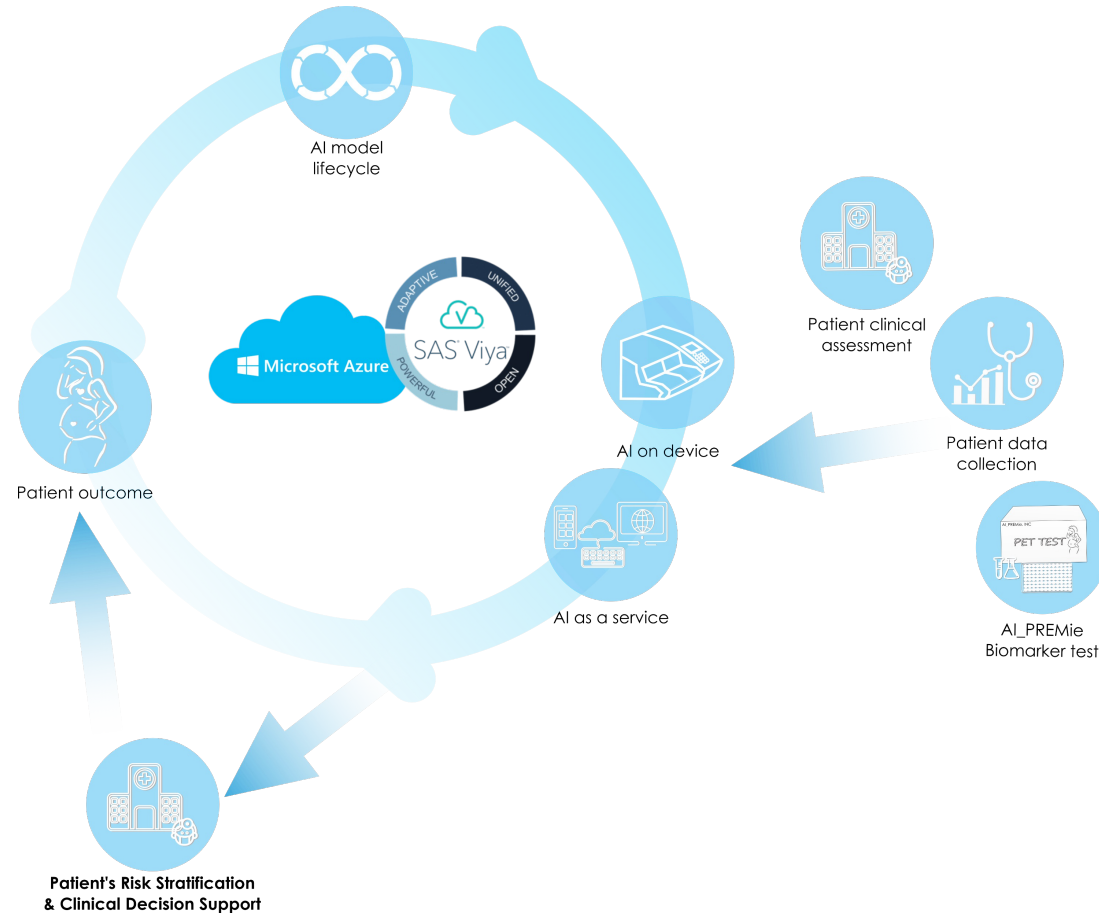
Connected health with analytics accelerated by technology



Where do we start? The Rotunda pilot



AI_PREMie: A unified biosignature



Effective, Efficient Clinical Decision Making

Vision



OUR TEAM WANTS AI_PREMIE TO BE AVAILABLE FOR ALL PATIENTS WHO NEED IT



*Our work is dedicated to
all those who are affected by Preeclampsia.*



Thank you
