# DOKTER, WAT IS HET VOOR DCIS WEER?

Jelle Wesseling
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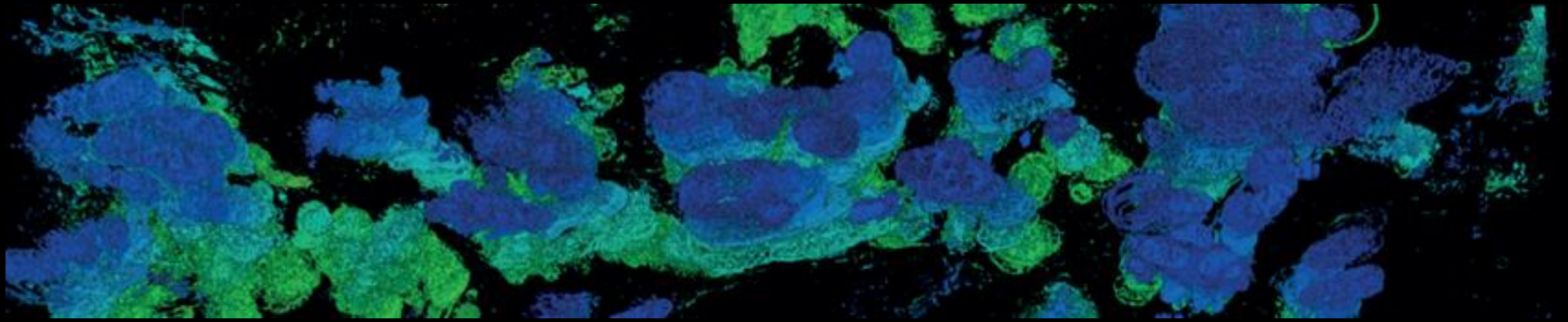

# DIT VERHAAL KAN NIET ZONDER



KWF

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# DRIE VRAGEN

CANCER GRAND CHALLENGES

Team: PRECISION

1. **WAT IS HET PROBLEEM?**

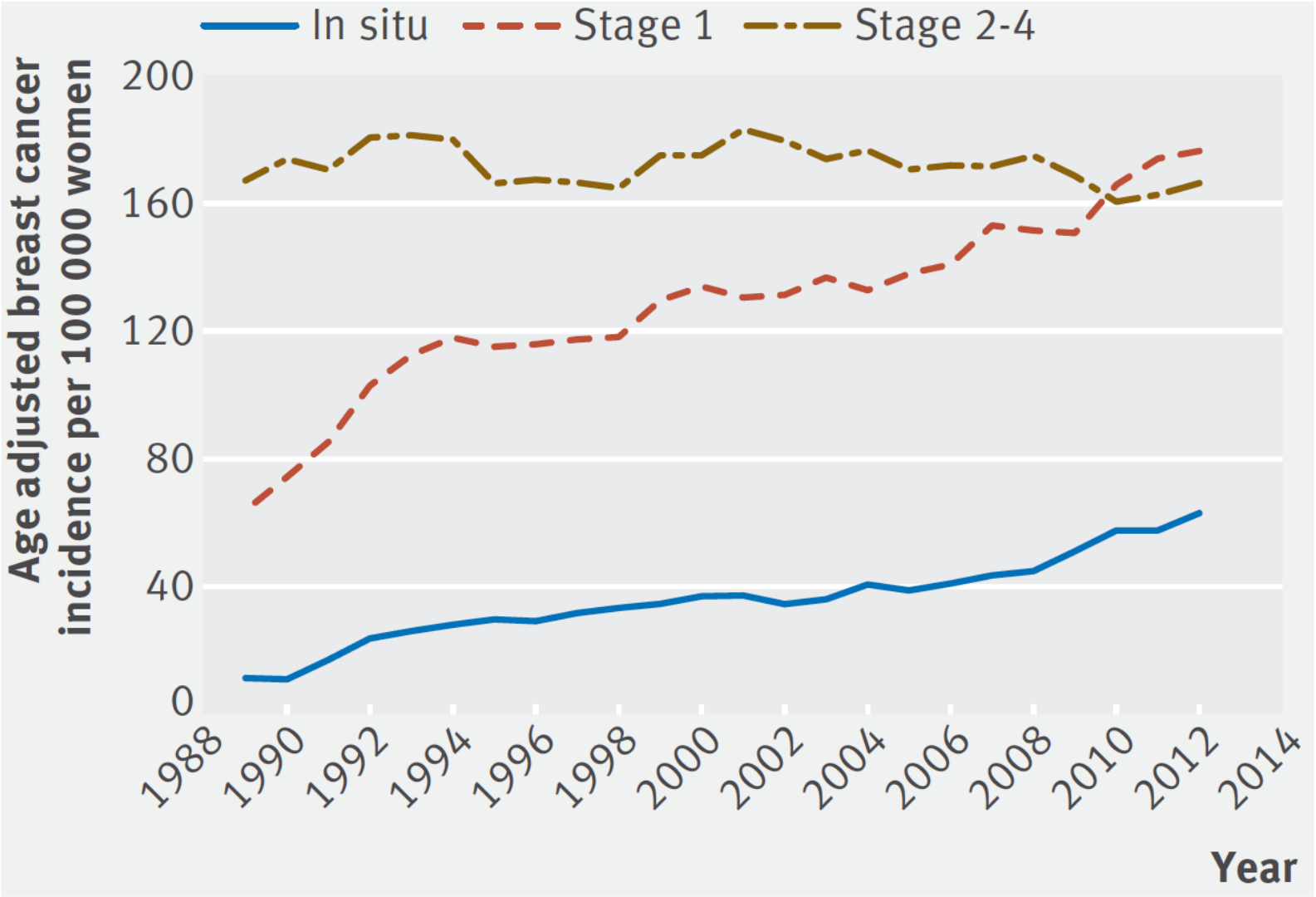
2. **WAT IS (SLECHTS) HET BEGIN VAN DE OPLOSSING?**

3. **WAT IS DE OPLOSSING VAN HET PROBLEEM IN DE ECHTE WERELD?**

# 1. WAT IS HET PROBLEEM?

# HET GAAT OVER DE ONGEMAKKELIJKE WAARHEID VAN DCIS






*Autier et al., 2017, BMJ 359:j5224*

# WANT DCIS KAN MEESTAL GEEN KWAAD

CANCER GRAND CHALLENGES | Team: PRECISION

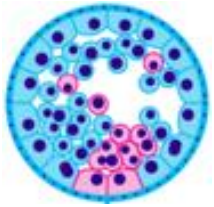
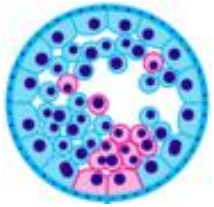
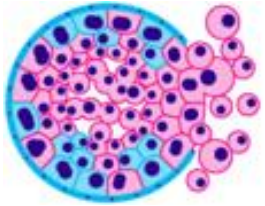
- Tot 25% van alle door sreening gedetecteerde ‘borstkankers’
- ~80% van alle DCIS is niet progressief en daarom ongevaarlijk
- DCIS zelf leidt niet tot overlijden
- Onmogelijk progressief van niet progressief DCIS te onderscheiden
- Bijna alle vrouwen met DCIS worden behandeld


*Autier et al. (2017), BMJ 359:j5224*
*Bleyer and Welch (2012), NEJM 367:1998-2005*
*Siegel et al. (2018), CA Canc. J. for Clinicians 68:7-30*
*American Cancer Society (2019)*
*Cancer Research UK (2020)*
*Elshof et al. (2018), Annals Surg. 267:952-958*
*Roses et al. (2011), Annals Surg. Oncol. 18:2873-2878*
*Ernster et al. (2000), Arch. Int. Med. 180:953-958*
*Ryser et al. (2019), JNCI 111:952-960*
*Grimm et al. (2017), Ann. Surg. Oncol. 24:3524-3540*
*Elshof et al. (2016), Breast Canc. Res. Treatm. 159:553-563*
*Rakovitch et al. (2013), Breast Canc. Res. Treatm. 138:581-590*
*Falk et al. (2011), Breast Canc. Res. Treatm. 129:929-938*
*Maxwell et al. (2018), Eur. J. Surg. Oncol. 44:429-435*
*Maxwell et al. (2022), Breast 61:145-155*


**Vele vrouwen met niet progressief DCIS dragen de last van zinloze behandeling**

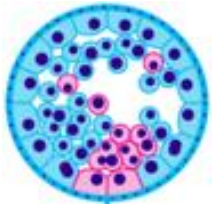
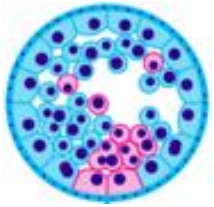
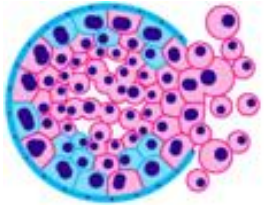
# IDEALITER WIL JE HET BELOOP VAN DCIS ACCURAAT VOORSPELLEN

CANCER GRAND CHALLENGES | Team: PRECISION


| *t=0* | *t=x* | *Behandeling op t=0?* |
|---|---|---|
|  Indolent DCIS |  Indolent DCIS | ***NEE*** |
|  Progressief DCIS |  Borstkanker | ***JA*** |

# HELAAS LEIDT ONZEKERHEID TOT OVERBEHANDELING INDOLENT DCIS

CANCER GRAND CHALLENGES | Team: PRECISION


| *t=0* | | *t=x* | *Behandeling op t=0?* |
|---|---|---|---|
|  Indolent DCIS | ? |  Indolent DCIS | ***JA*** |
|  Progressief DCIS | ? |  Borstkanker | ***JA*** |

# INFORMATIEVE WAARDE VEEL DCIS STUDIES ZEER BEPERKT

CANCER GRAND CHALLENGES | Team: PRECISION

- Kleine series, korte follow-up, weinig 'events'
- DICS zeer heterogeen
- Behandeling van DCIS is variabel
- Uitkomst niet uniform gedefinieerd
- Interobserver variabiliteit

**Wat nodig is om het beter te doen:**

- Grote, a-selectieve series (n>10,000s)
- Details diagnose en behandeling
- Lange termijn follow-up (>10 jaar)
- Robuuste designs (case-control, etc.)
- Weefselblokjes
- Mutlidisplinaire experts en benadering



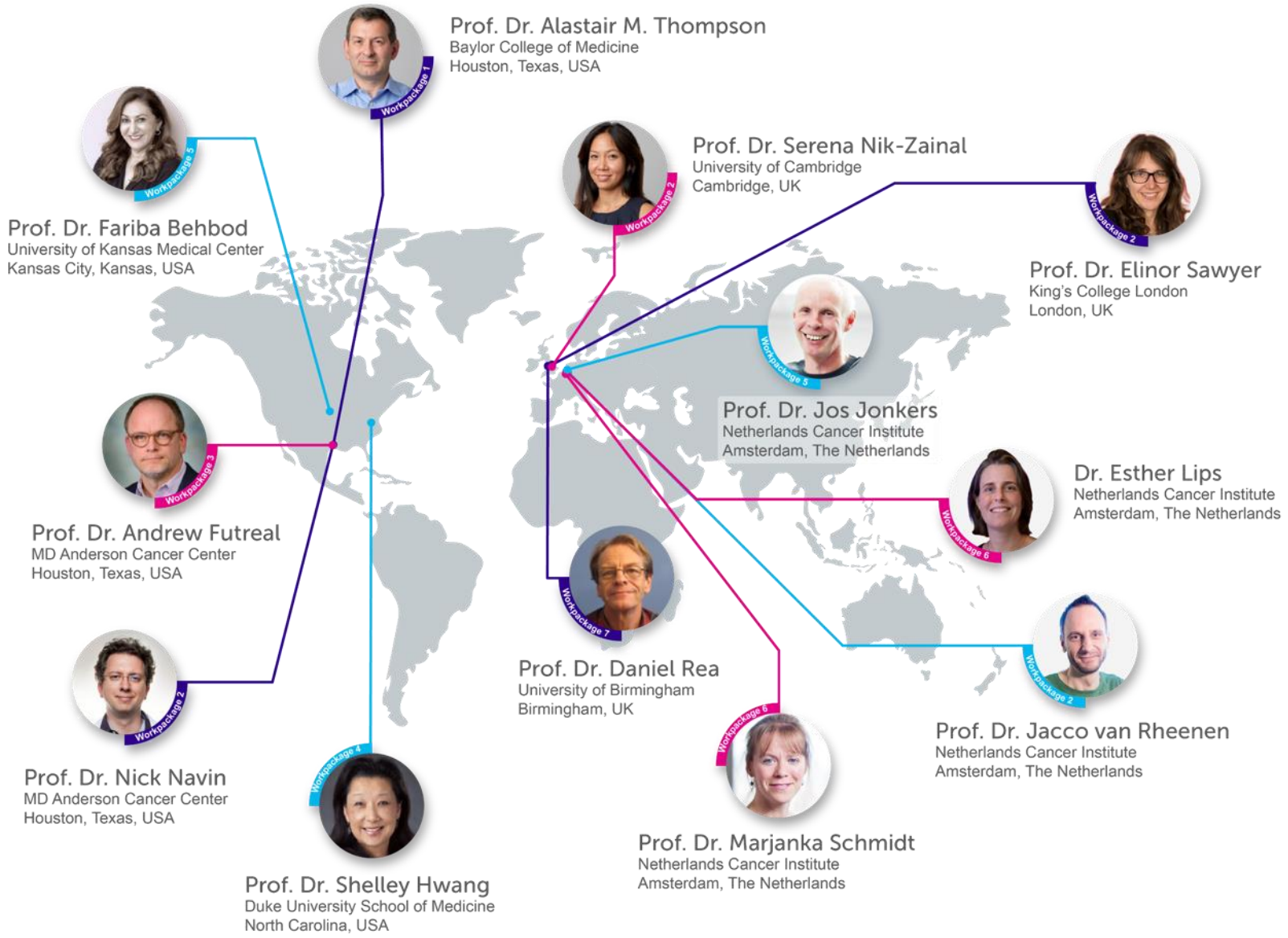
*Visser et al., 2019, Cancer Epidemiol. Biomarkers Prevention 28:835-845*

# 2. WAT IS (SLECHTS) HET BEGIN VAN DE OPLOSSING?

# VOOR KLINISCHE IMPACT IS MULTIDISCIPLINAIRE SYNERGIE VEREIST

CANCER GRAND CHALLENGES

Team: PRECISION

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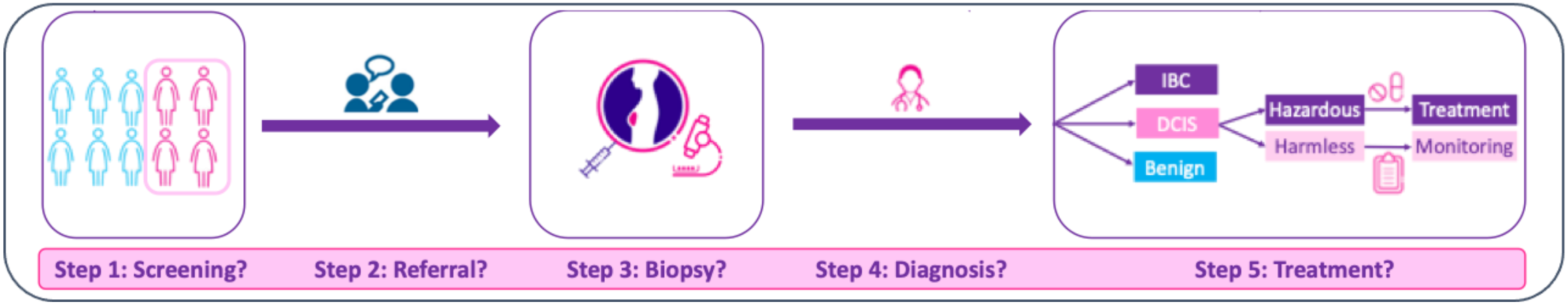
# DCIS MANAGEMENT VEREIST ‘PRECISION’ IN HET ZORGPAD

CANCER GRAND CHALLENGES

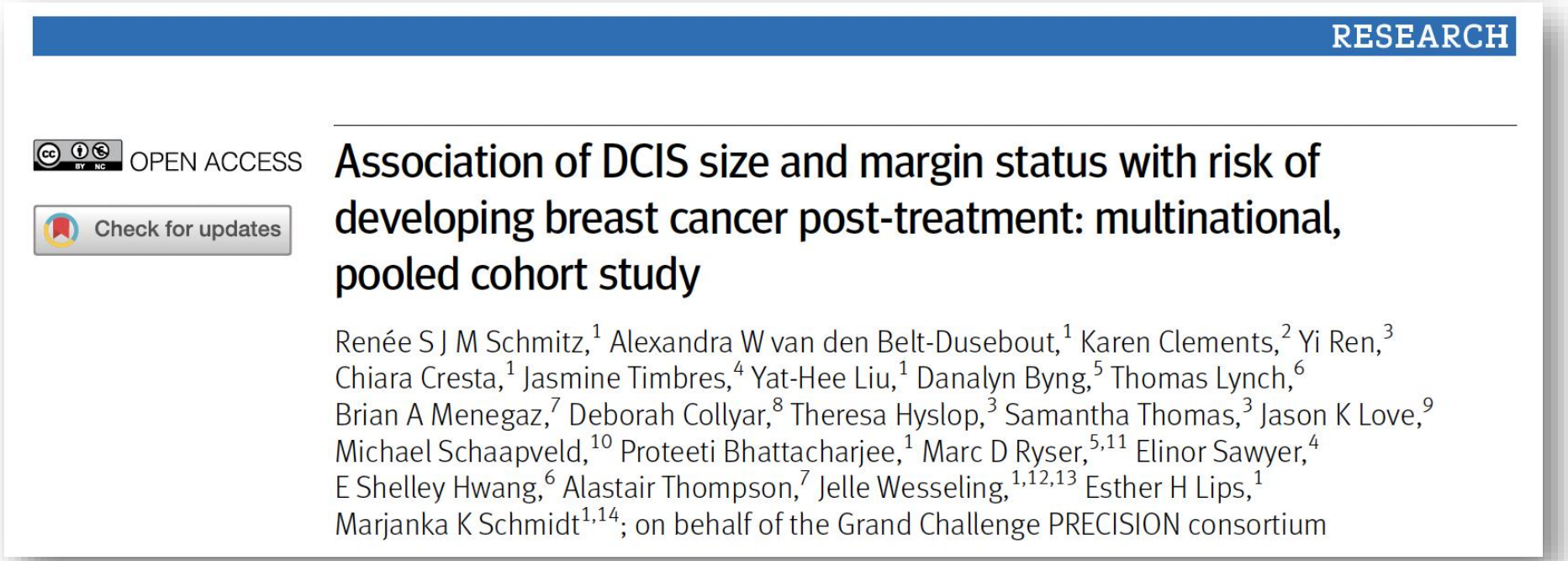
Team: PRECISION



# GROTE SERIES GOED GEANNOTEERDE DATA EN SAMPLES CRUCIAAL

CANCER GRAND CHALLENGES | Team: PRECISION

- Samengesteld cohort van meer dan 47.000 vrouwen met DICS uit VK, VS en Nederland
- Status sneevlak en grootte afwijking beperkt geassocieerd met risico op ipsilateralaal borstkanker
- Slechts 3,2% risico op ipsilaterale borstkanker na 10 jaar



RESEARCH

OPEN ACCESS

Check for updates

## Association of DCIS size and margin status with risk of developing breast cancer post-treatment: multinational, pooled cohort study

Renée S J M Schmitz,[1] Alexandra W van den Belt-Dusebout,[1] Karen Clements,[2] Yi Ren,[3] Chiara Cresta,[1] Jasmine Timbres,[4] Yat-Hee Liu,[1] Danalyn Byng,[5] Thomas Lynch,[6] Brian A Menegaz,[7] Deborah Collyar,[8] Theresa Hyslop,[3] Samantha Thomas,[3] Jason K Love,[9] Michael Schaapveld,[10] Proteeti Bhattacharjee,[1] Marc D Ryser,[5,11] Elinor Sawyer,[4] E Shelley Hwang,[6] Alastair Thompson,[7] Jelle Wesseling,[1,12,13] Esther H Lips,[1] Marjanka K Schmidt[1,14]; on behalf of the Grand Challenge PRECISION consortium



*Schmitz et al. on behalf of PRECISION, British Medical Journal (2023) 83:e076022*

# KUNNEN WE NIET ZORGEN DAT WE MINDER DOORVERWIJZEN?

CANCER GRAND CHALLENGES | Team: PRECISION

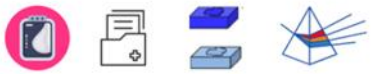
**Breast-CAlcification Risk Evaluation (Breast-CARE)**

- **Population:**
- Screen-detected breast calcifications only
- 2010-2019
- **Methods:**
- Registry-based cohort study
- (AI-enabled) radiomics
- **Data:** 

**Characterization of high- and low-risk Benign Breast Disease (CharBBD)**

- **Population:**
- Initially diagnosed benign BD (NKI)
- 2006-2021
- **Methods:**

1) Case-control study
2) (AI- enabled) radiomics

- **Data:** 

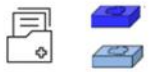
**Common aim:**
**Distinguish high-risk from low-risk breast lesions to prevent unnecessary diagnostics and treatment**

**Prognostic value of mammographic calcification descriptors**

- **Population:**
- DCIS presented as mammographic calcifications
- 2000-2022
- **Methods:**

Systematic review and meta-analysis

**DCIS & sentinel node positivity (SNOP)**

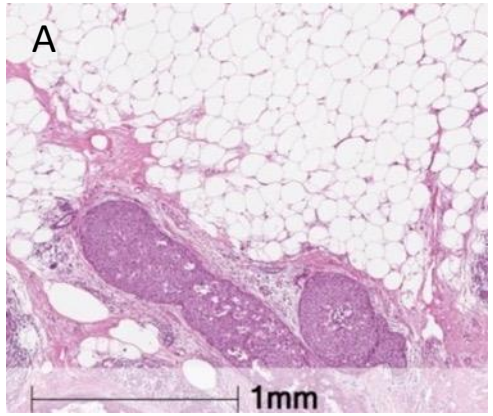
- **Population:**
- Registered DCIS SN+ cases
- 2005-2020
- **Methods:** National registry-based cohort study
- **Data:** 

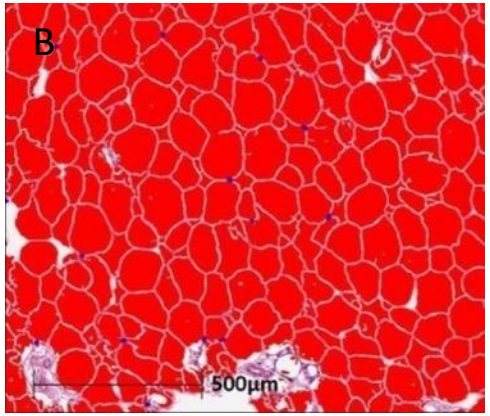


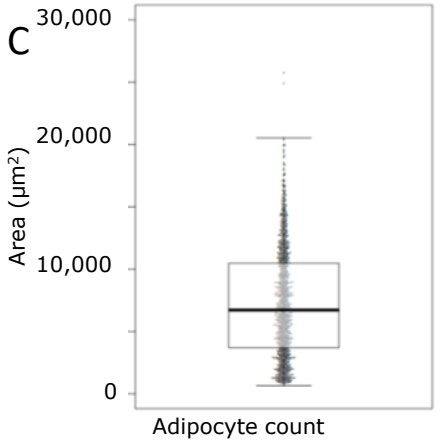
*Merle van Leeuwen et al., Insights Imaging (2023) 4:213 & ongoing projects*

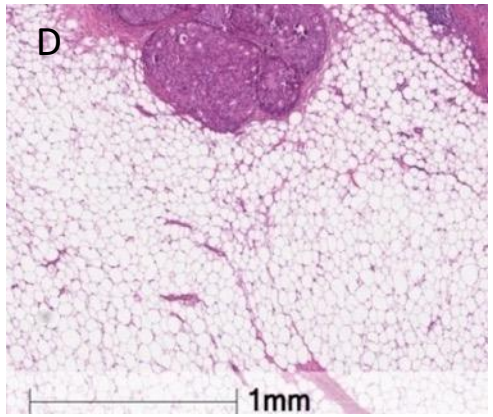
# VETCELLEN$^{GROOT}$ / COX-2$^{HOOG}$ GEASSOCIEERD MET HOOG RISICO

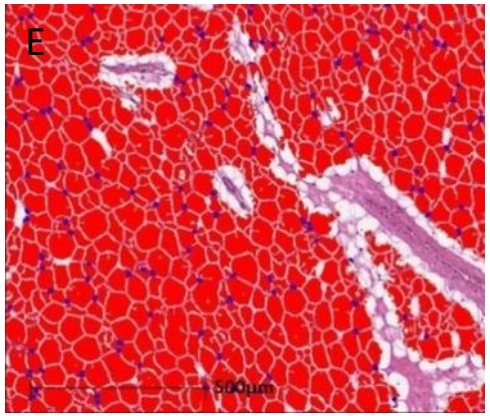
CANCER GRAND CHALLENGES | Team: PRECISION

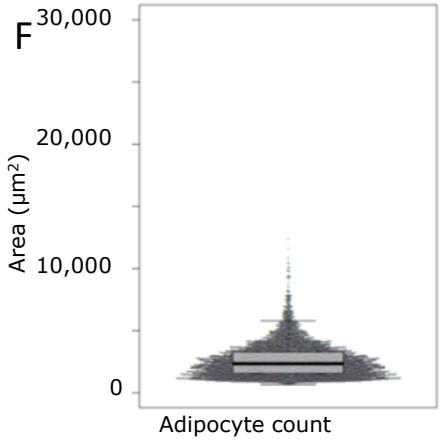


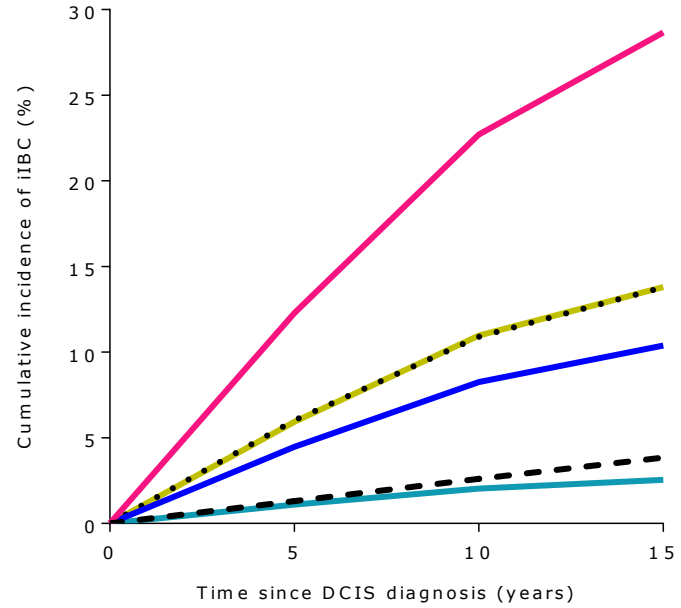



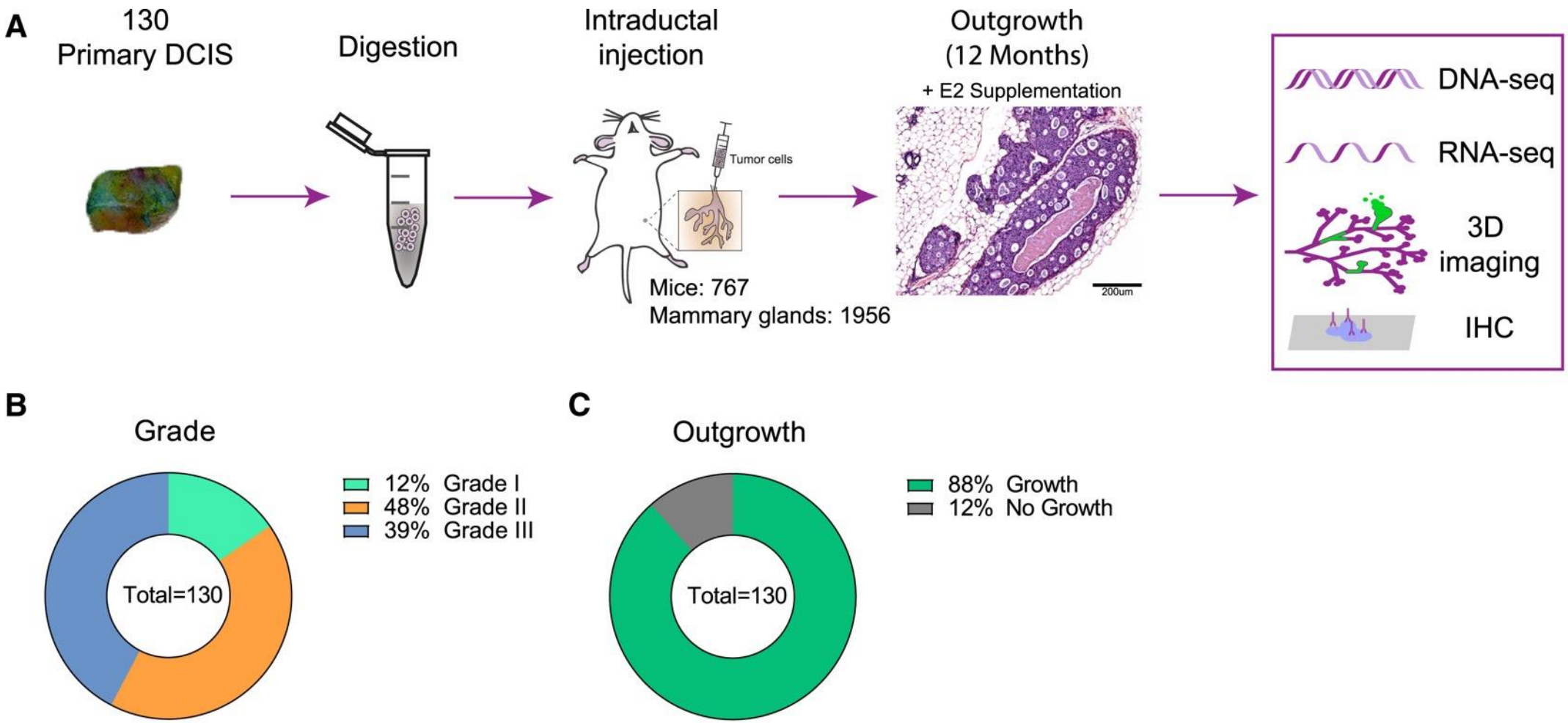

| | Adipocyte area$^{75th}$/COX-2 | 10-year (%) | 15-year (%) |
|---|---|---|---|
| ···· | Overall cumulative incidence | 10.9 | 13.8 |
| — | Area$^{75th}$q4/COX-2 high | 22.7 | 28.7 |
| — | Area$^{75th}$q4/COX-2 low | 8.3 | 10.4 |
| — | Area$^{75th}$q1-3/COX-2 high | 11.0 | 13.8 |
| — | Area$^{75th}$q1-3/COX-2 low | 2.0 | 2.6 |
| - - | General population | 2.6 | 3.9 |






*Mathilde Almekinders et al., on behalf of the Grand Challenge PRECISION Team, NPJ Breast Cancer. 2021 Mar 22;7(1):31*

# PREKLINISCHE MUISMODELLEN LATEN PROGRESSIE DCIS LIVE ZIEN

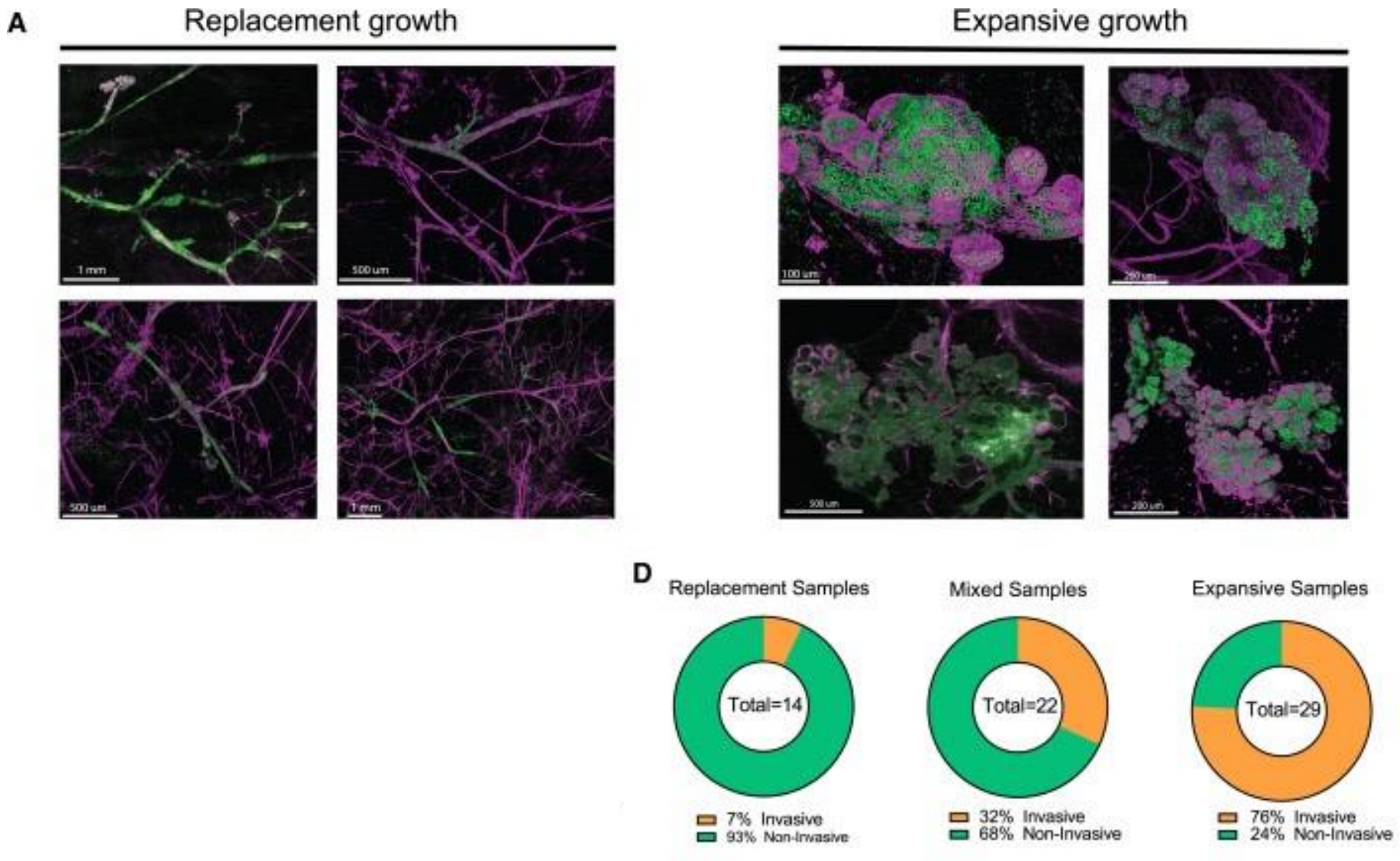





*Hutten et al., on behalf of the Grand Challenge PRECISION Team, Cancer Cell 2023 May 8;41(5):986-1002*

# GROEIWIJZE BEPAALT RISICO OP INVASIEVE GROEI







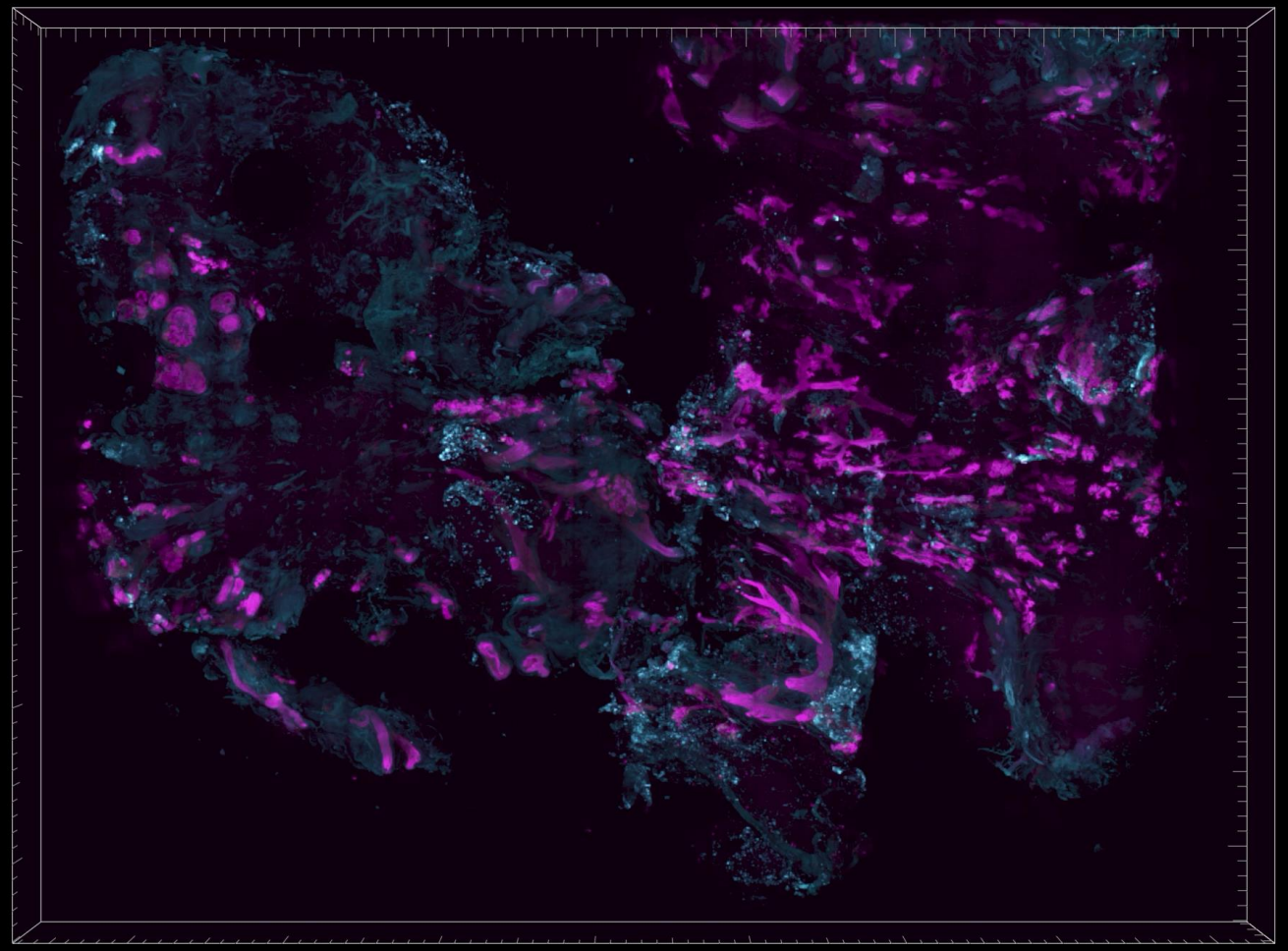

*Hutten et al., on behalf of the Grand Challenge PRECISION Team, Cancer Cell 2023 May 8;41(5):986-1002*

# ZIEN WE DAT IN 3D OOK BIJ VROUWEN MET DCIS?

CANCER GRAND CHALLENGES

Team: PRECISION

Resection DCIS
(local excision)

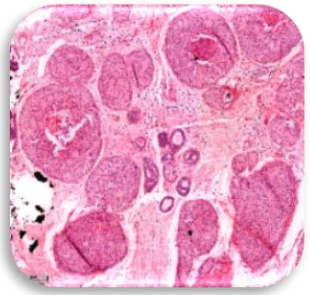


*Messal et al., also on behalf of the PRECISION Grand Challenge Team; under revision for Nature*

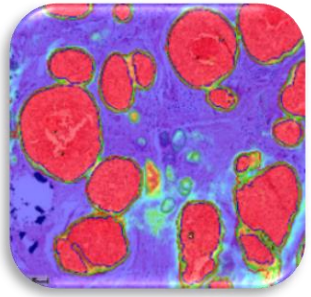
# KUNNEN WE DIT VERTALEN NAAR 'GEWONE' COUPES IN DE KLINIEK?

CANCER GRAND CHALLENGES

Team: PRECISION



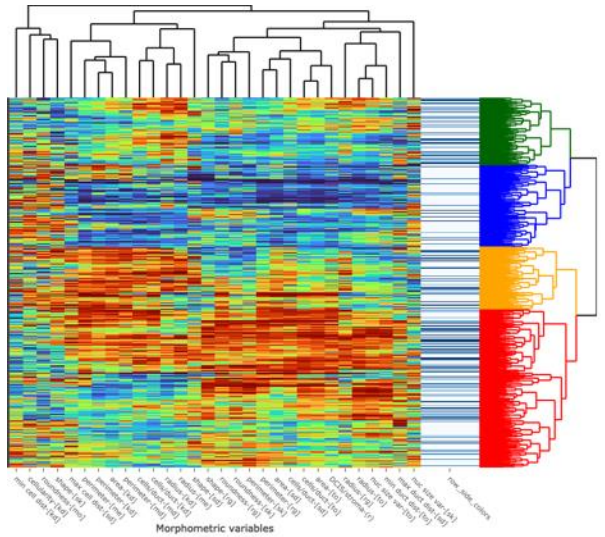
*H&E coupes*



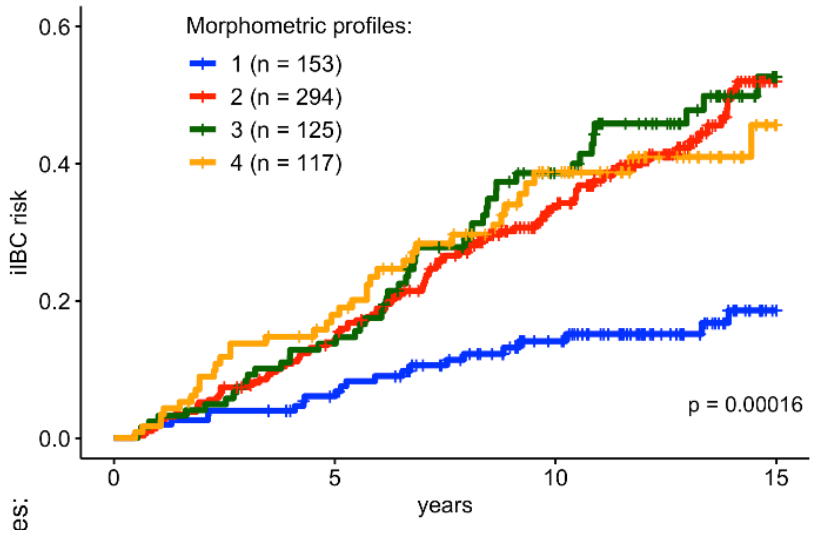
*DCIS gedetecteerd*

| | Y0 | X1 | Y1 | X2 | |
|---|---|---|---|---|---|
| 0.000 | 0 | 1212.031 | 255 | 1235.259 | 0 |
| 0.596 | 0 | 1154.259 | 255 | 1176.295 | 0 |
| 1.191 | 0 | 1119.119 | 255 | 1141.155 | 0 |
| 1.787 | 0 | 1051.221 | 255 | 1079.809 | 0 |
| 2.382 | 0 | 1013.699 | 255 | 1034.544 | 0 |
| 2.978 | 0 | 983.919 | 255 | 998.809 | 0 |
| 3.574 | 0 | 942.228 | 255 | 961.882 | 0 |
| 4.169 | 0 | 910.065 | 255 | 926.147 | 0 |
| 4.765 | 0 | 889.220 | 255 | 897.558 | 0 |
| 360 | 0 | 830.256 | 255 | 861.823 | 0 |

*Morfologische metingen*




*Clusteren morfologische kenmerken*




*Blauwe lijn is laag risico DCIS*

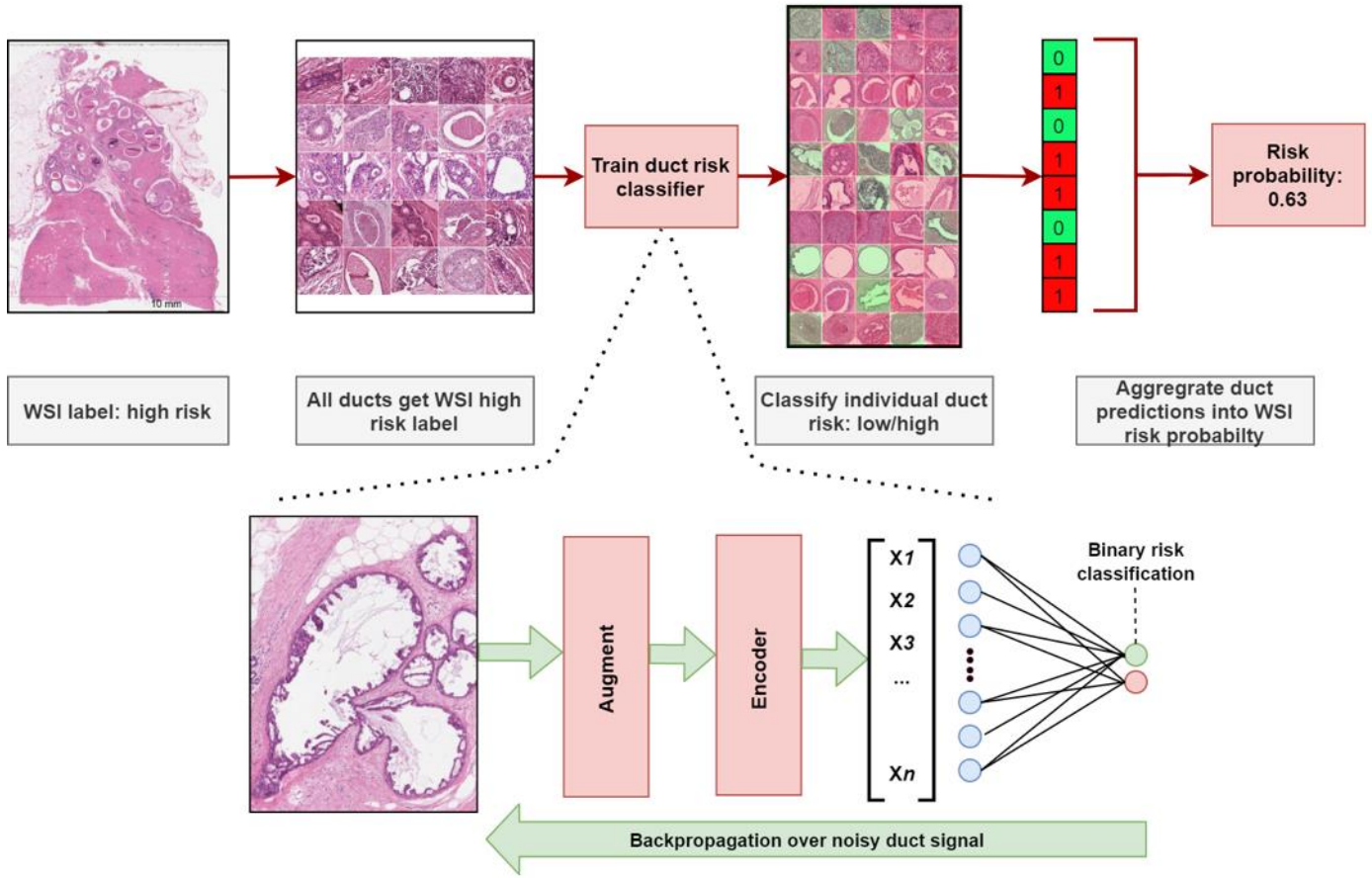


*Marcelo Sobral-Leite, manuscript under revision (npj Digital Oncology)*

# AI KAN HELPEN OM LAAG VAN HOOG RISICO DCIS TE ONDERSCHEIDEN

CANCER GRAND CHALLENGES

Team: PRECISION




1. Voorspellen of er invasief mammacarcinoom ontstaat met een AUC van 0.78
2. Onafhankelijke validatie gepland

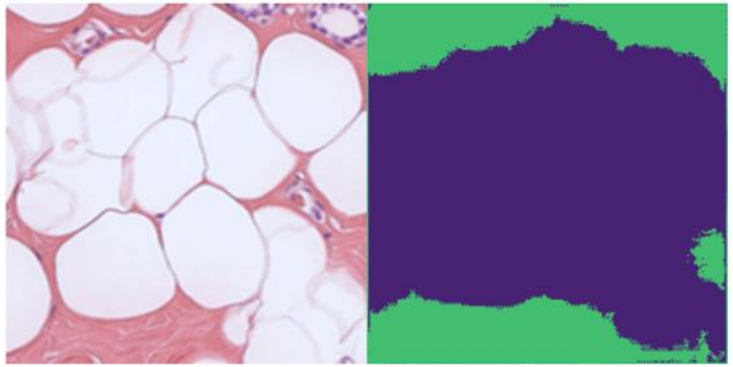
*Shannon Doyle, in preparation*

# DAARBIJ KAN JE KIEZEN VOOR MEERDERE BENADERINGEN …

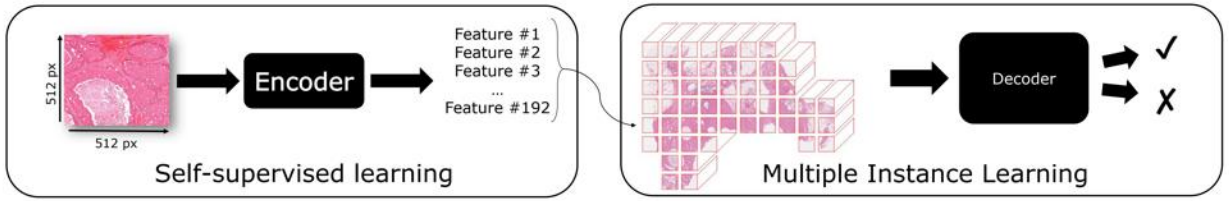
CANCER GRAND CHALLENGES | Team: PRECISION

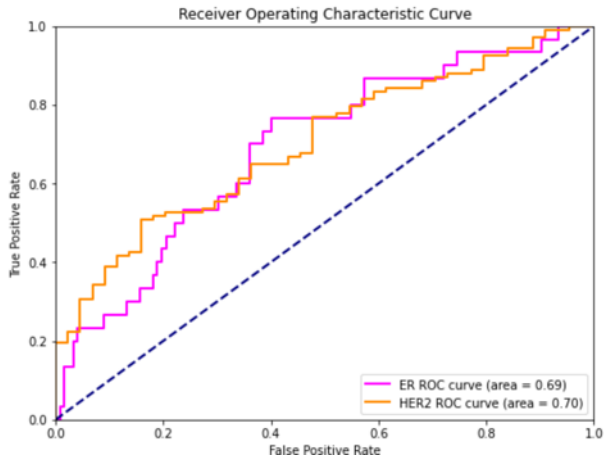
**Verbeteren segmentatiemodellen**

- Als je het beeld draait, dan zou de segmentatie ook moeten draaien
- Werkt dit ook voor segmentatie van de ducten?



**Kan je zo biomarkers voorspellen o.b.v. hele coupes?**






*Marek Oerlemans, in preparation*

# RNASEQ IDENTIFICEERT LAAG RISICO DCIS MET HOGE 'NPV'

CANCER GRAND CHALLENGES

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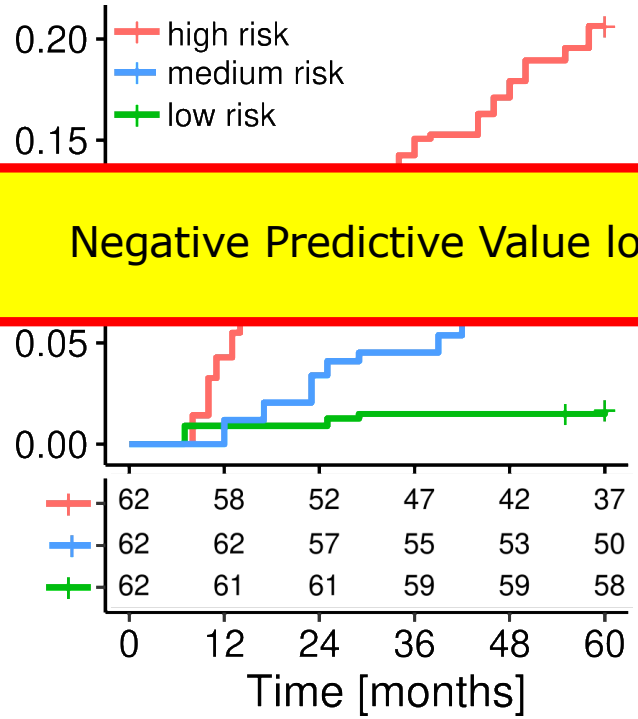
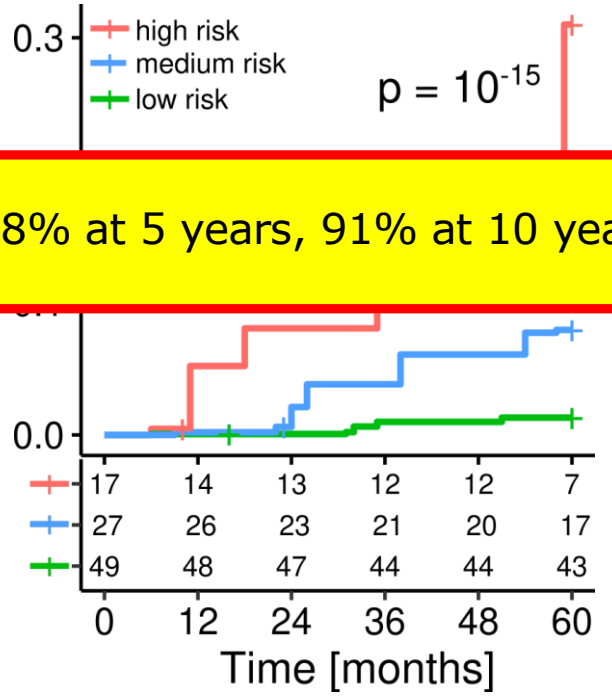



*Developed on Dutch DCIS-cohort*




*Validated on UK-Sloane cohort*

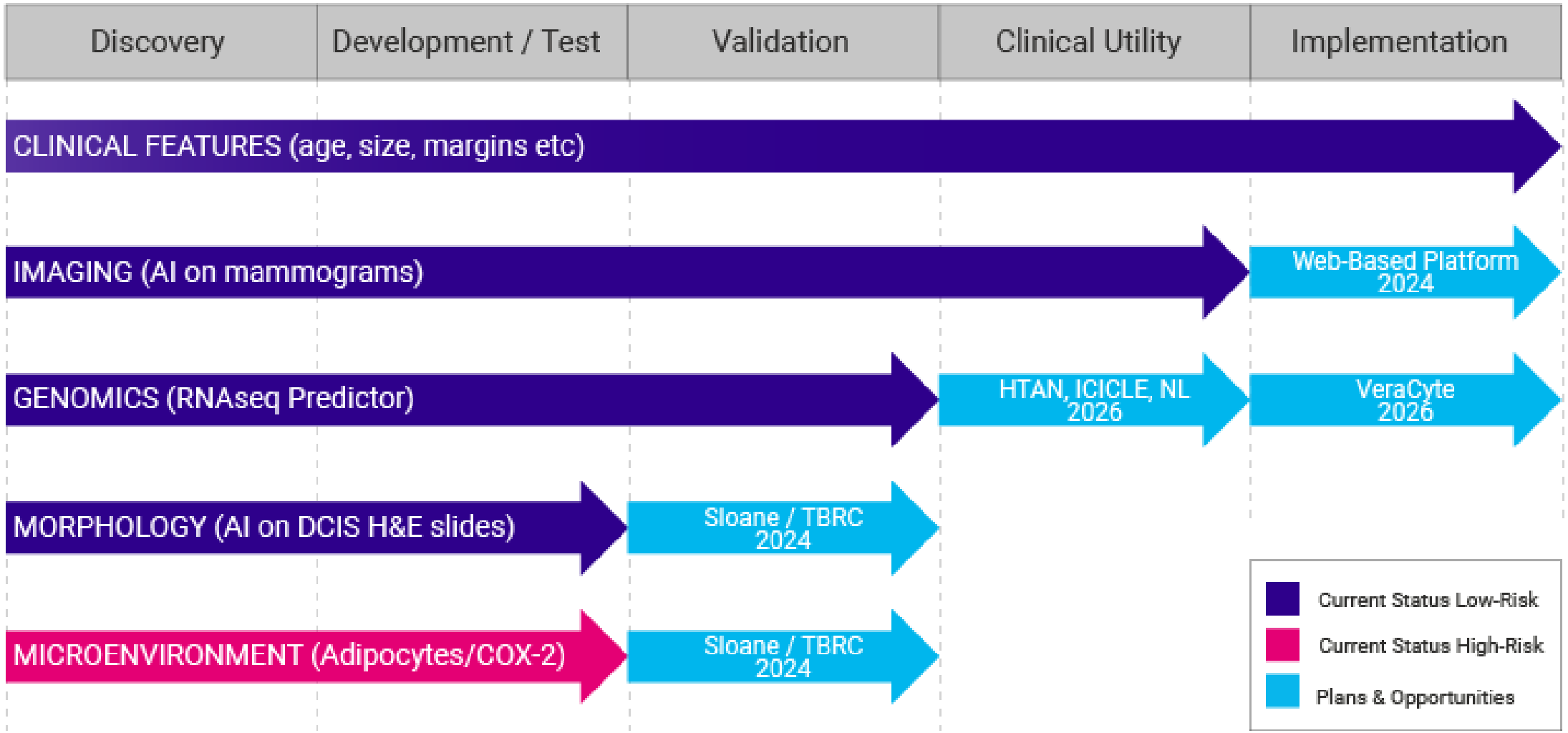
Negative Predictive Value low-risk group 98% at 5 years, 91% at 10 years

*Will Harley, Esther Lips et al., in preparation*

# PRECISION OUTPUT OP WEG NAAR KLINISCHE IMPLEMENTATIE

CANCER GRAND CHALLENGES

Team: PRECISION



# PROSPECTIEVE VALIDATIE PROGNOSTISCHE MARKERS IS LASTIG

CANCER GRAND CHALLENGES

Team: PRECISION

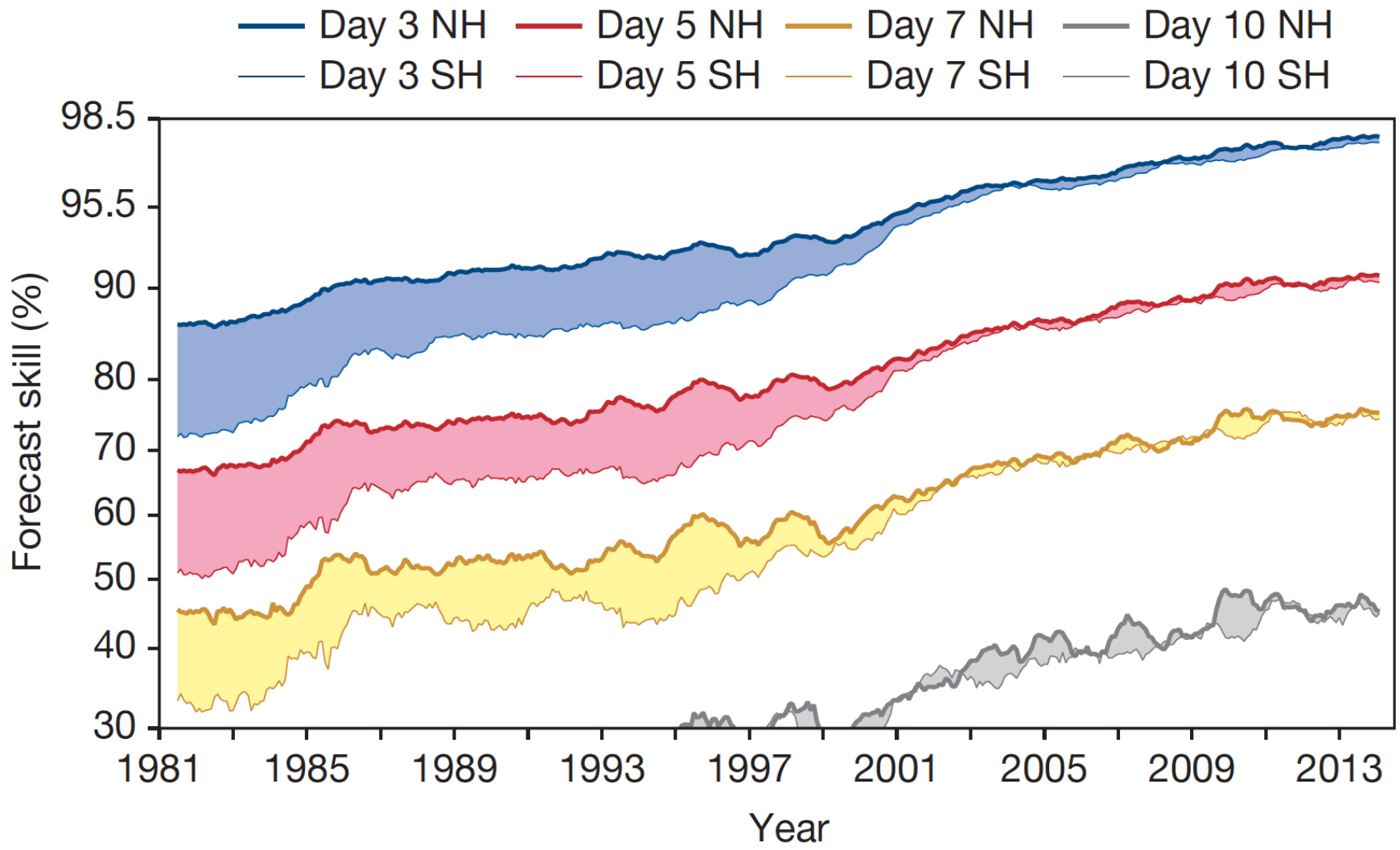
- DCIS is afwijking met een laag risico, dus weinig ‘events’
- Weinig grote, goed gedefinieerde, niet selectieve series beschikbaar
- Cruciale inputwaardes veranderen met de tijd


ERROR

# 3. WAT IS DE OPLOSSING VAN HET PROBLEEM IN DE ECHTE WERELD?

# LEREN VAN HOE DE WEERSVOORSPELLING STEEDS BETER WORDT …

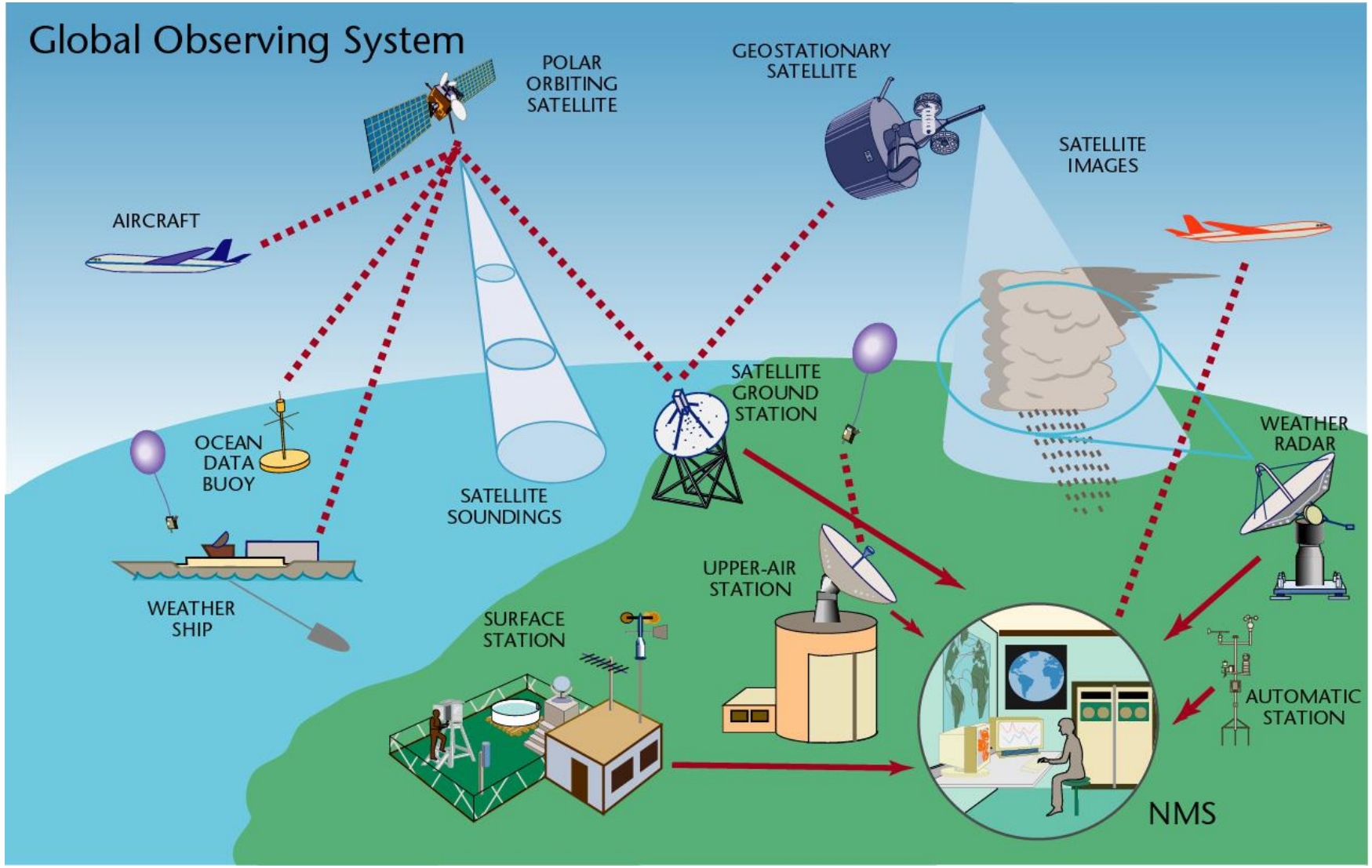





*Bauer, Thorpe, Brunet; Nature (2015) 525:47-55*

# DANKZIJ OBSERVATIES EN METINGEN VAN MULTIDIMENSIONELE DATA








https://atmosphere.copernicus.eu/observations

# WEERSVOORSPELLING GEBASEERD OP DRIE PILAREN

CANCER GRAND CHALLENGES

Team: PRECISION

- Geografische en historische data inzake weer en klimaat
- Recente waarnemingen en metingen (multidimensionele data)
- Modelleren m.b.v. AI en/of ‘numerical weather prediction’ (NWP)

# WAT IS DE TOEGEVOEGDE WAARDE EN BEPERKING VAN DEZE ANALOGIE

CANCER GRAND CHALLENGES

Team: PRECISION

**Toegevoegde waarde**

- Ontwikkelen model zonder voorafgaande training en/of prospectieve validatie
- Toevoegen nieuwe relevante variabelen ‘on-the-fly’

**Beperking**

- Modelleren weersvoorspelling gebaseerd op wetten in de fysica

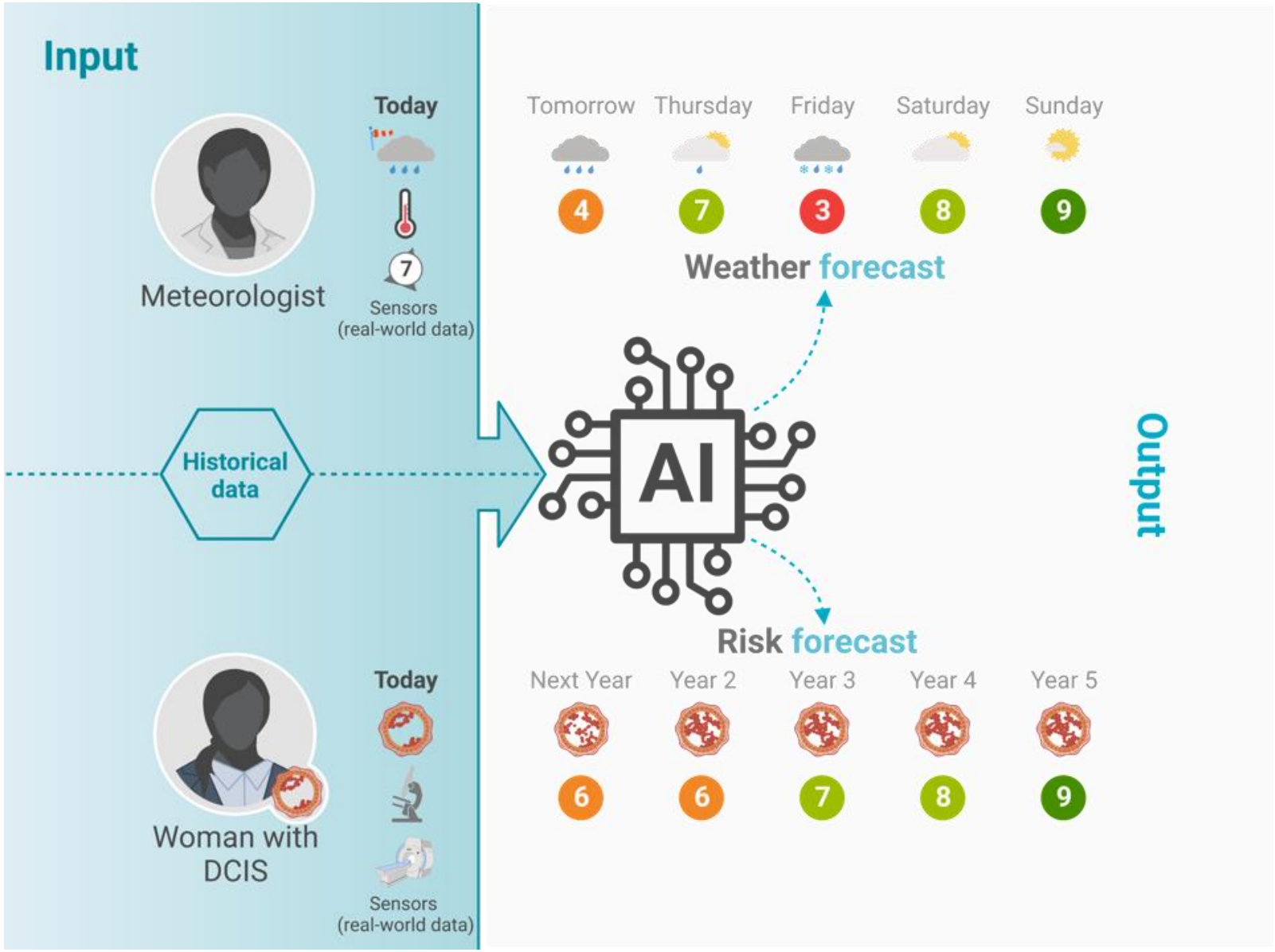
**Absolute voorwaarde**

- Excellente kwaliteit data vereiste om vergelijkingen/verbanden hieruit af te leiden

# DIRECT DCIS OM OVERBEHANDELING TE VOORKOMEN

CANCER GRAND CHALLENGES

Team: PRECISION

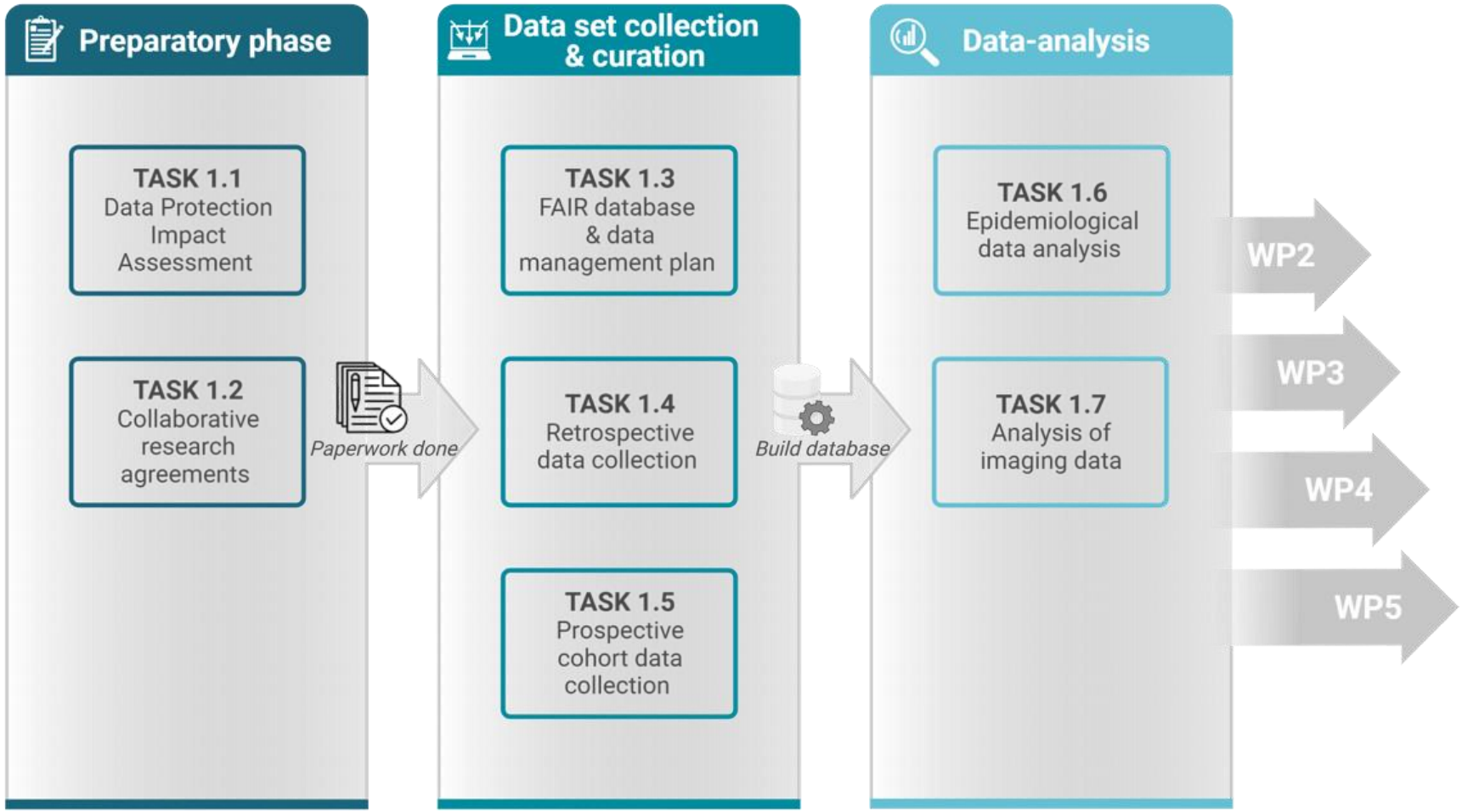


# INTEGRATIE VAN HISTORISCHE EN REAL WORLD DATA IS DE BASIS

CANCER GRAND CHALLENGES

Team: PRECISION

**Leiding: Esther Lips (NKI)**



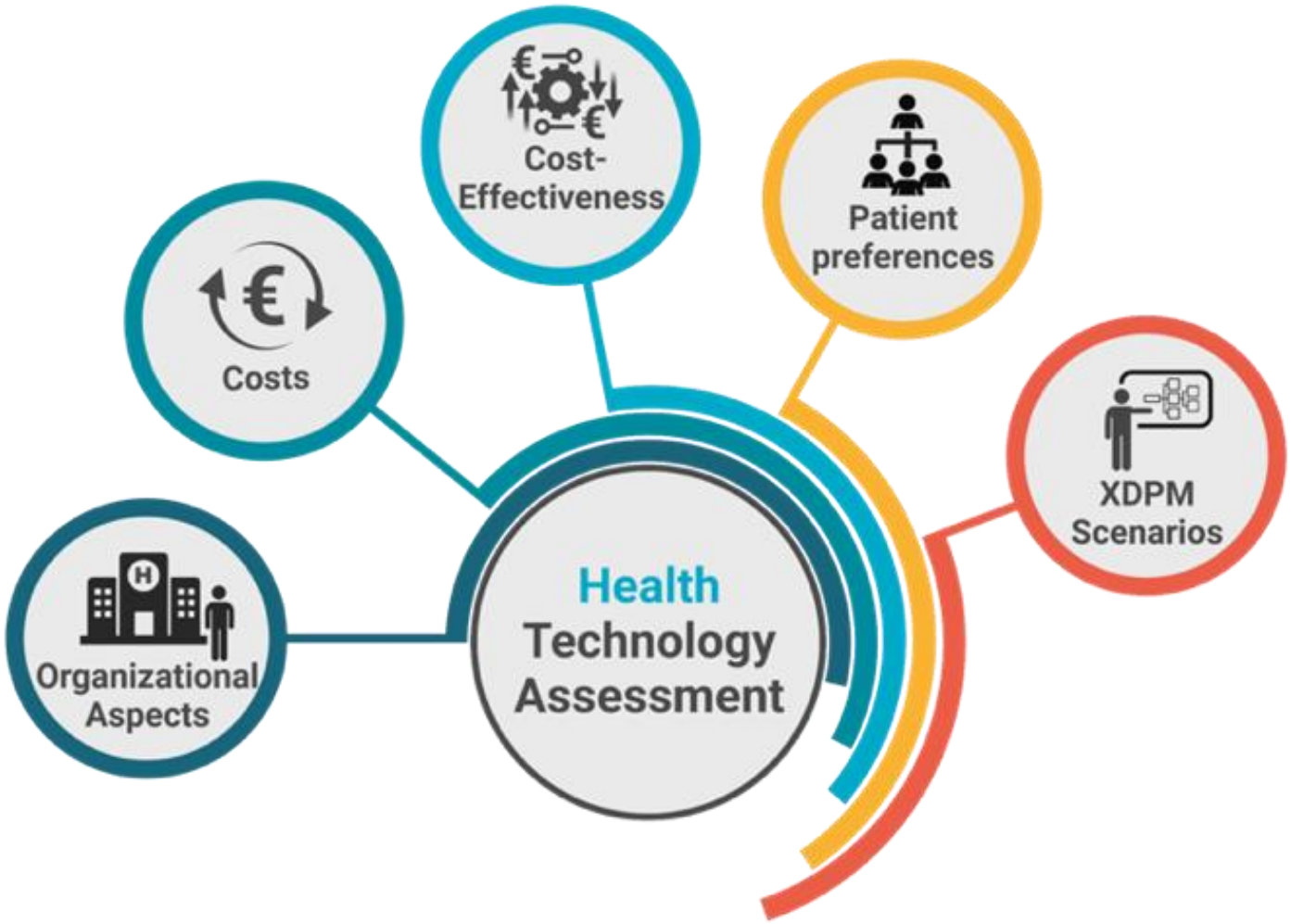

*NKI: Marjanka Schmidt; Radboudumc: Mireille Broeders; RIVM: Patricia Hugen; PALGA: Rinse Voorham; IKNL: Sabine Siesling, Linda de Munck, Janneke Verloop; IQVIA: Jacqueline Hartgerink; DEARhealth: Katinka de Korte*

# VOORKEUR PATIËNT IS LEIDEND; IS HET OOK KOSTEN-EFFECTIEF?

CANCER GRAND CHALLENGES

Team: PRECISION

**Leiding: Valesca Retèl (NKI, EUR) & Esther de Bekker-Grob (EUR)**

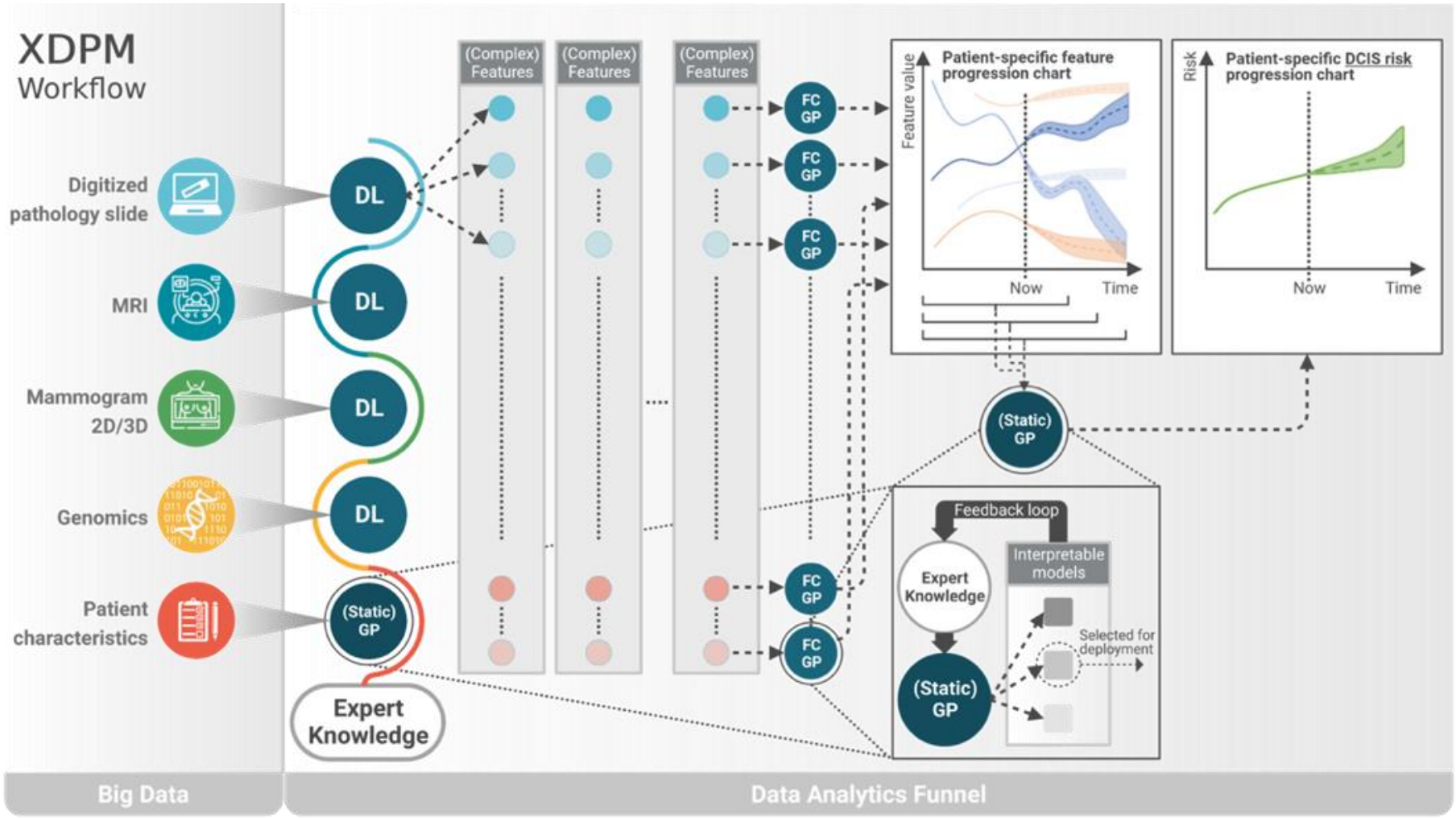


# IS EXPLAINABLE DYNAMIC PREDICTIVE MODELLING DE OPLOSSING?

CANCER GRAND CHALLENGES

Team: PRECISION

**Leiding: Peter Bosman (CWI & TU Delft) en Tanja Alderliesten (LUMC)**




*Dr.ir. J. Teuwen (NKI-AVL), Dr. R. Mann (NKI-AVL, Radboud UMC), Prof.dr.ir. H.W.J. (Herman) Russchenberg, Prof. dr. A.P. (Pier) Siebesma (TU Delft Climate Institute), Prof.dr. L.F.A. Wessels (NKI-AVL, TU Delft), Prof.dr.ir. M. Staring (LUMC), DEARhealth, IQVIA – CTcue*

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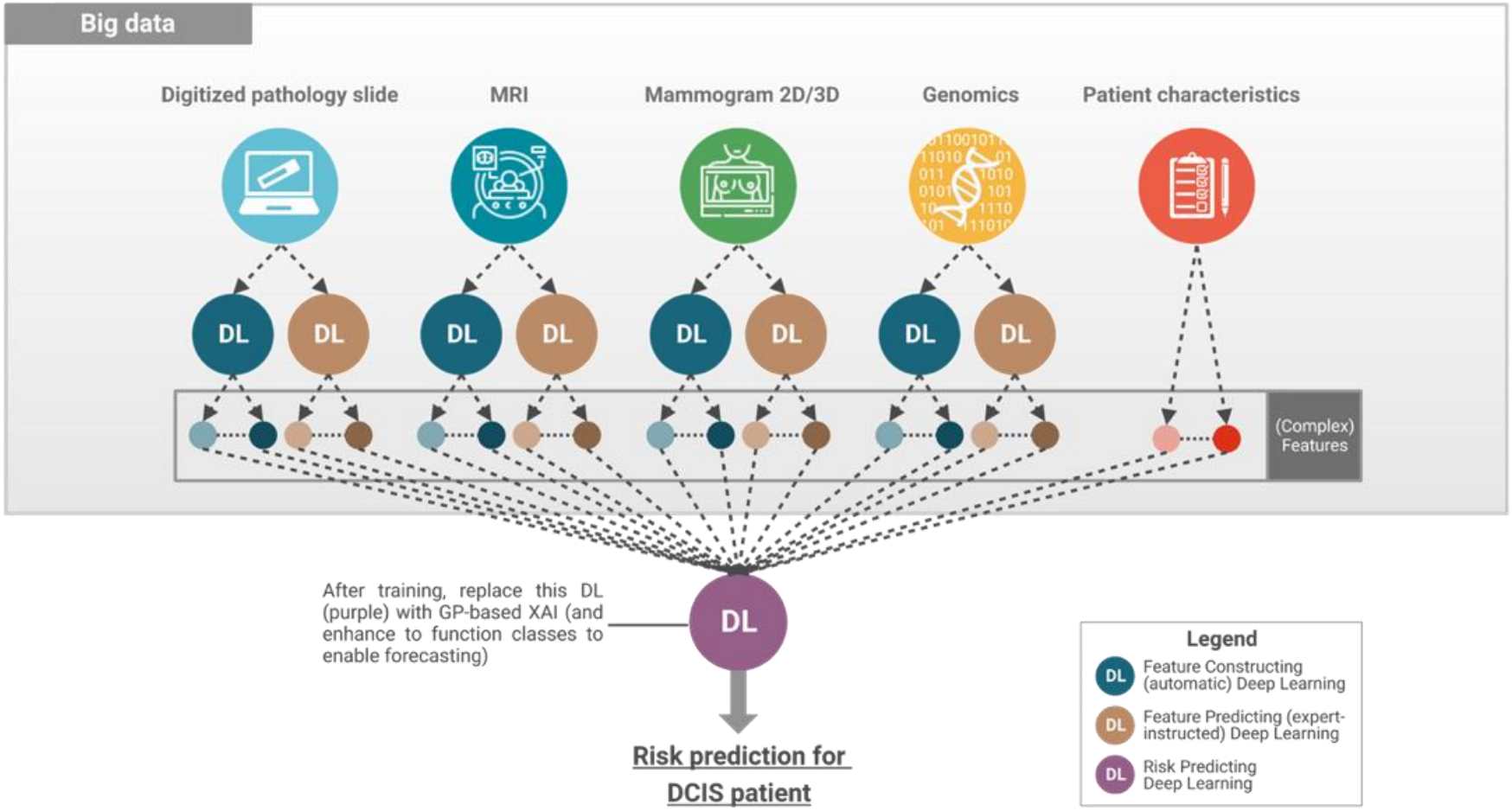


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# INTEGRATIE VAN XDPM IN DEARhealth PLATFORM

CANCER GRAND CHALLENGES | Team: PRECISION

## Patient app

DIRECT-DCIS cohort have access to user-friendly UI to provide data and personal preferences, to review the personal real-time health status, the personalized 12 months care pathway, disease education and supporting programs (e.g. MyMentalhealth, MyMenu, MyFitness etc.)

**DEARhealth Production Platform**

**eXplainable dynamic predictive modelling XDPM**

XDPM Data platform

Pseudonymized data

**Clinical Evaluation**

**Add the new validated XDPM data to DCIS medical model**

### Real time data analyses

for proven results of onboarded DCIS cohort (savings, **HC consumption**, health outcomes, satisfaction)

### New DCIS data input

as result of XDPM Explainable AI and Machine Learning research

### Clinical Evaluation

of XDPM results

### Innovate Recommendations

by applying the validated XDPM results

In a MDR compliant *

*DEARhealth is MDR class II-a certified software as a medical device. Patient Safety First. No black box AI allowed

# IMPLEMENTATIE EN EVALUATIE VAN XDPM VOOR DCIS

CANCER GRAND CHALLENGES

Team: PRECISION

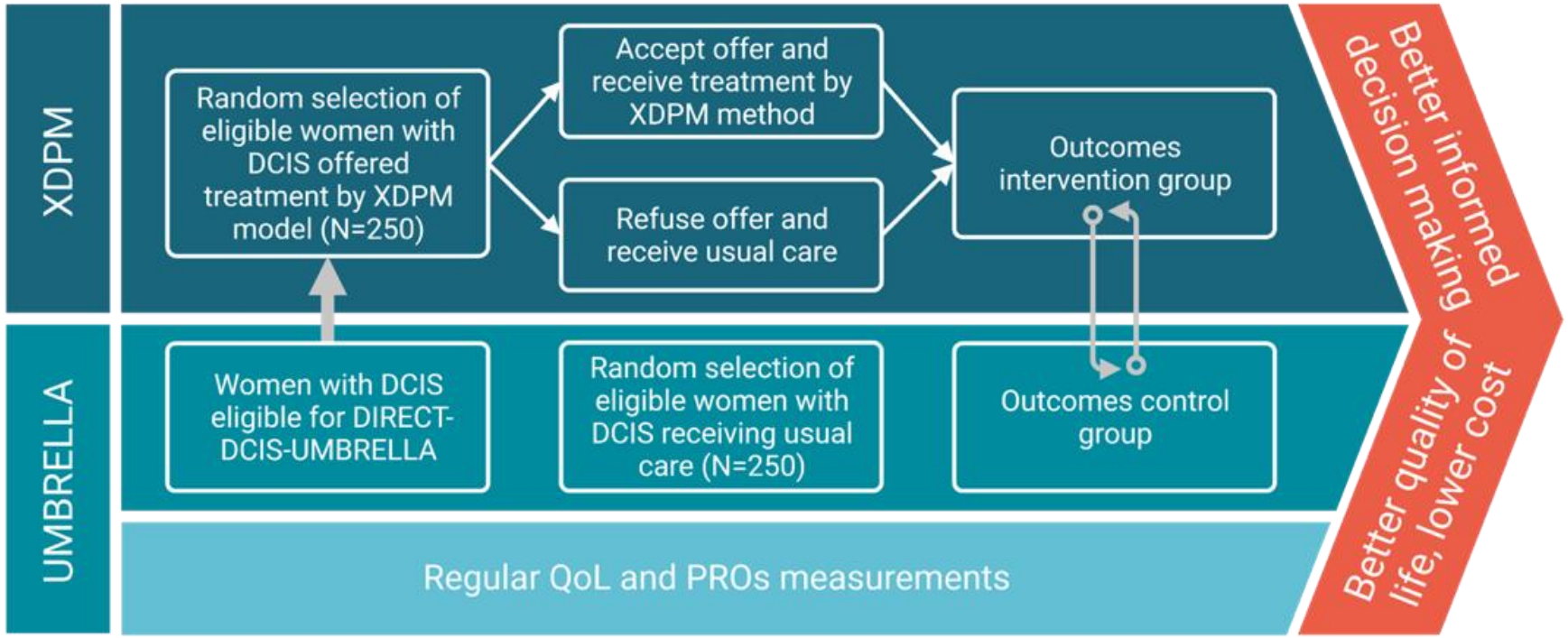
**Leiding: Lenny Verkooijen (UMCU)**


*QoL and PRO vragenlijsten gedurende follow-up*

# KANS OM XDPM IN CONTEXT VAN UMBRELLA (EN LORD) TE TESTEN

CANCER GRAND CHALLENGES | Team: PRECISION

**Leiding: Lenny Verkooijen (UMCU)**

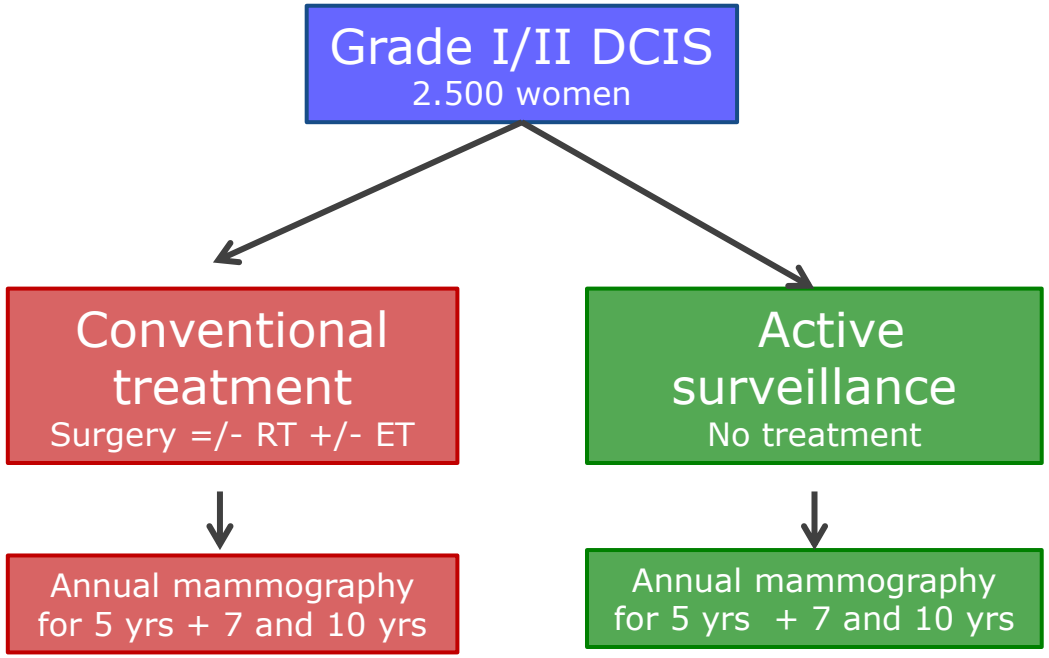



*Trials within Cohorts (TwiCs) design voor de DIRECT-DCIS studie*

# IS 'ACTIVE SURVEILLANCE' VEILIG VOOR LAAG RISICO DCIS?

CANCER GRAND CHALLENGES | Team: PRECISION

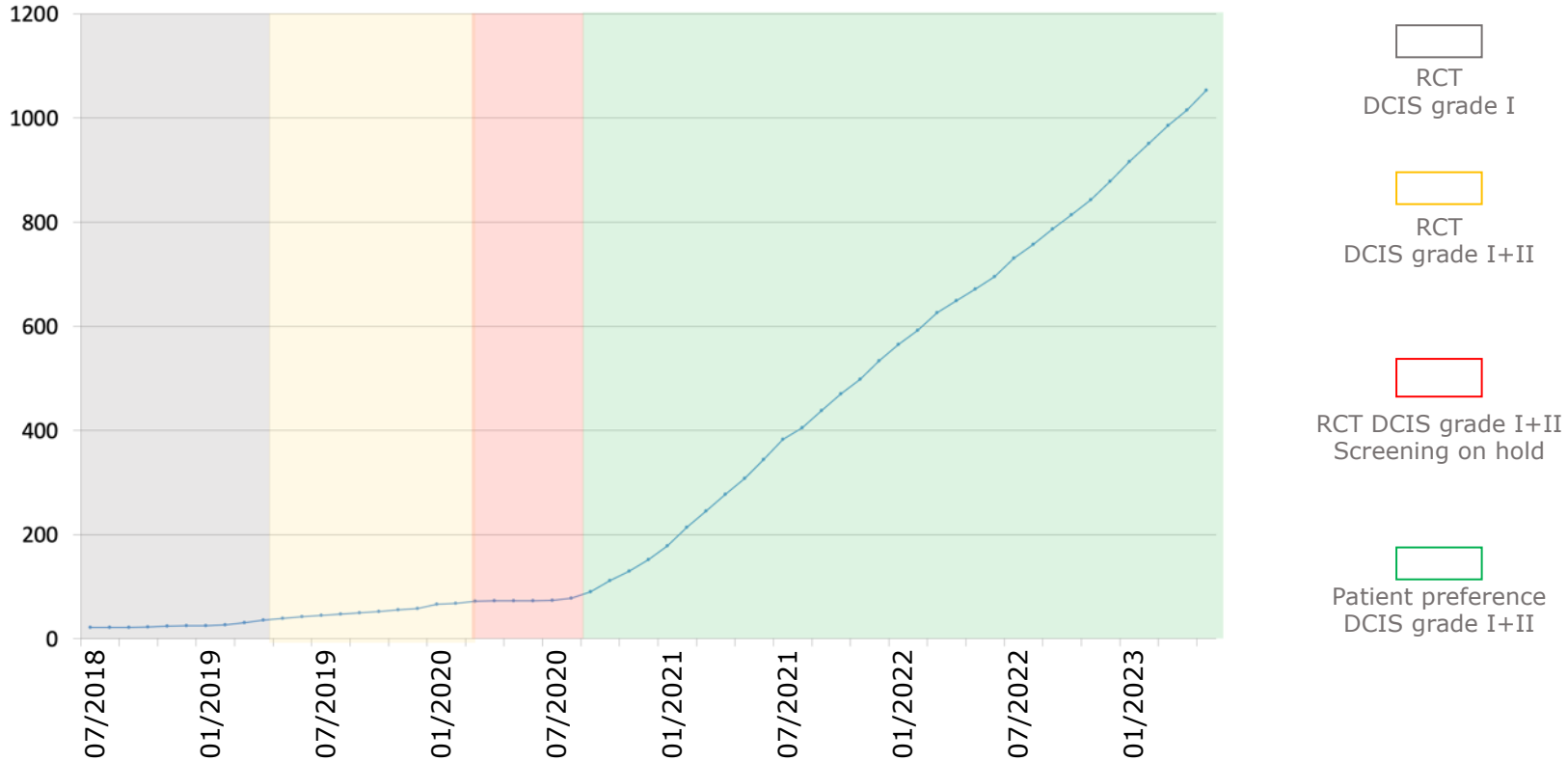
**Is active surveillance veilig voor ER-positief, HER-negatief graad I/II DCIS gevonden op basis van bij screening gedetecteerde calcificaties in vrouwen ouder dan 45 jaar?**



# ADEQUATE COMMUNICATIE LEIDT TOT BETERE INCLUSIE IN DE LORD

CANCER GRAND CHALLENGES | Team: PRECISION

- Bijna 60% van alle vrouwen met ER+/HER2- graad I of II DCIS worden geïncludeerd in NL
- Bijna 80% kiezen voor ‘active surveillance’

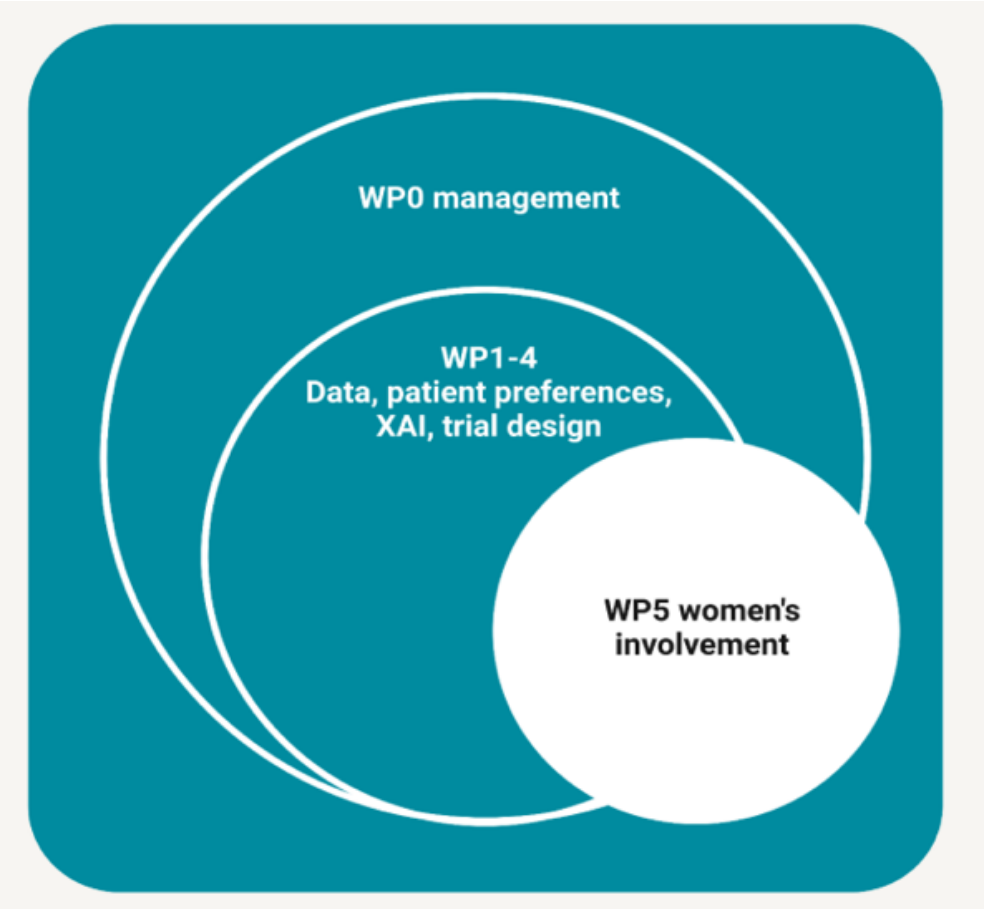


# INPUT VROUWEN NODIG VOOR AANPASSEN PRAKTIJK EN BELEID

CANCER GRAND CHALLENGES

Team: PRECISION

**Leiding: Nanne Bos (NIVEL)**






*Ria Wolkorte, Maya van den Berg (UT); Ellen Verschuur (BVN); Marjolein Scholten (BVN)*

# PROSPECTIEVE VALIDATIE PROGNOSTISCHE MARKERS IS LASTIG

CANCER GRAND CHALLENGES

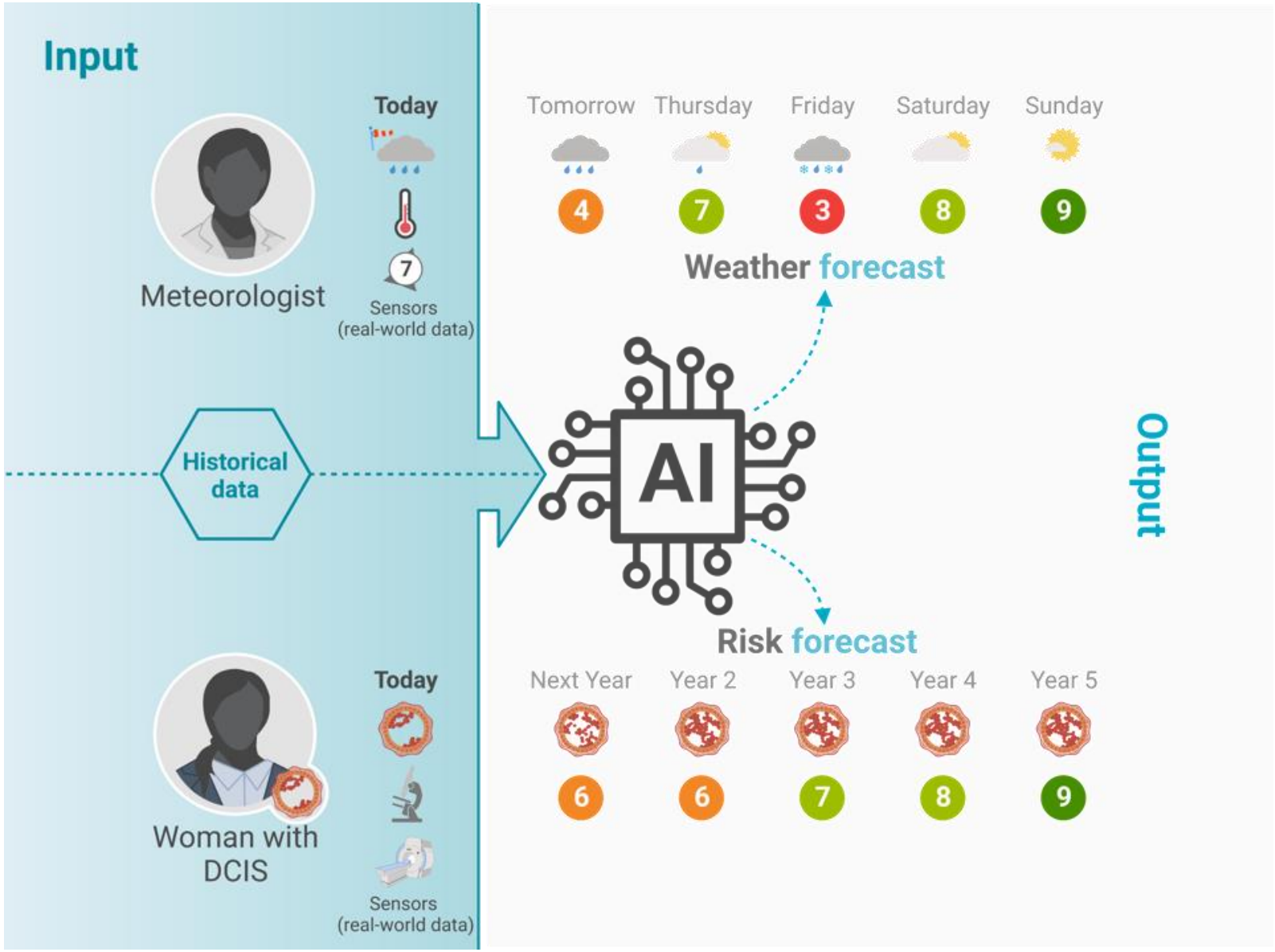
Team: PRECISION

- Overbehandeling niet-progressief DCIS voorkomen
- Kwaliteit van leven behouden
- Besparen maatschappelijke en zorggerelateerde kosten

# DIRECT DCIS OM OVERBEHANDELING TE VOORKOMEN

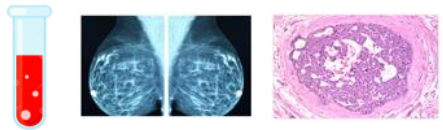
CANCER GRAND CHALLENGES

Team: PRECISION



# AMBITIE: VIRTUELE, WERELDWIJDE DCIS MONITORING KLINIEK

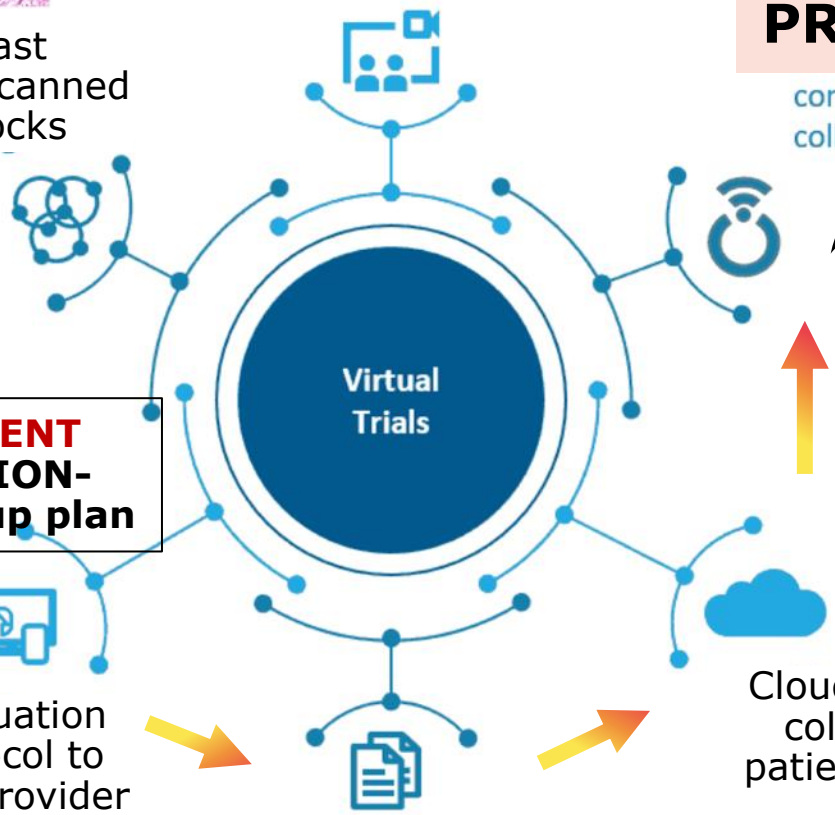
CANCER GRAND CHALLENGES | Team: PRECISION



Collection of breast imaging, pathology scanned images, tissue blocks (blood)

**INITIAL INTAKE**
Virtual assessment
e-consent

**RISK ASSESSMENT**
**SHARED DECISION-MAKING>follow up plan**




**VIRTUAL FOLLOW UP PROGRAM**

continuous data collection

Provision of risk evaluation and monitoring protocol to patient's health care provider

Electronic patient-reported outcomes

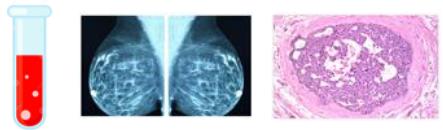
Cloud-based data collection and patient facing app



https://www.cloudbyz.com/resources/patient-recruitment/virtual-clinical-trial/

# AMBITIE: VIRTUELE, WERELDWIJDE DCIS MONITORING KLINIEK

CANCER GRAND CHALLENGES | Team: PRECISION



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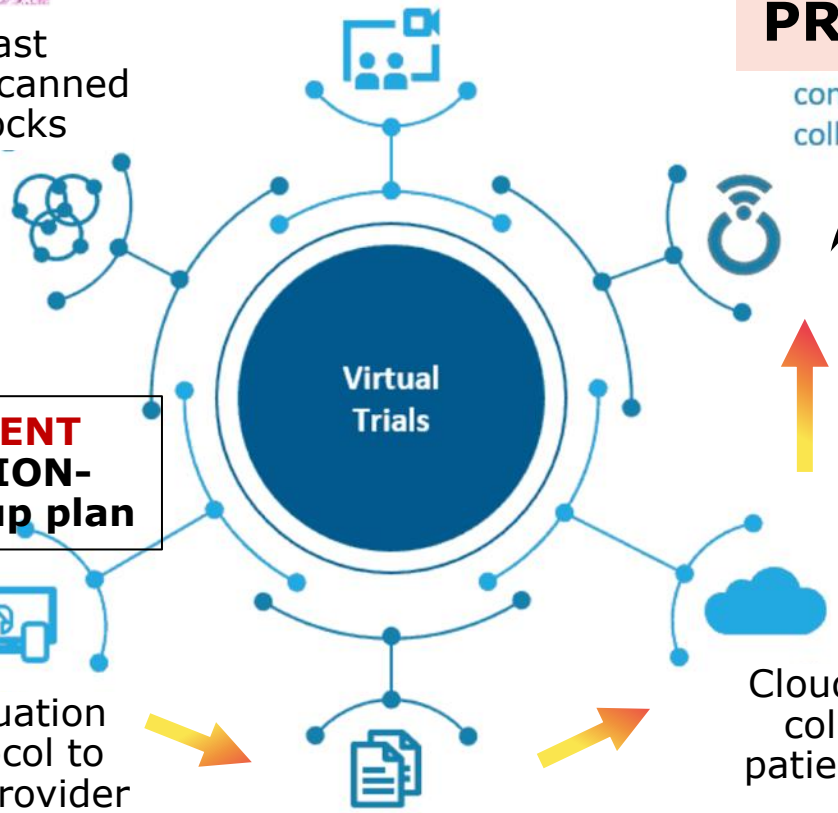


**VIRTUAL FOLLOW UP PROGRAM**

continuous data collection

Provision of risk evaluation and monitoring protocol to patient's health care provider

Electronic patient-reported outcomes

Cloud-based data collection and patient facing app

## BENEFITS OF A VIRTUAL CLINIC

**Cost effective**

Project costs would include website management, virtual risk assessment and shared decision making, 24-hour help desk

**Increased patient enrollment**

GLOBAL participation not limited by access to trial sites

**Reduced patient dropouts**

No additional physician visits, better patient follow-up through patient-powered engagement, access to help desk for general questions and support



https://www.cloudbyz.com/resources/patient-recruitment/virtual-clinical-trial/

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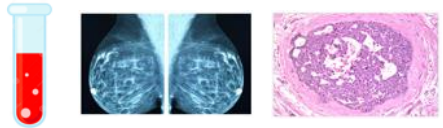
CANCER GRAND CHALLENGES | Team: PRECISION



Coll
imaging
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**INITIAL INTAKE**
Virtual assessment
e-consent

**VIRTUAL FOLLOW UP PROGRAM**

**RIS
SHA
MAKI**

Provision of risk evaluation and monitoring protocol to patient's health care provider

Electronic patient-reported outcomes

Cloud-based data collection and patient facing app

Patiënt centraal
Laagdrempelig toegang tot active surveillance
Inschatting risico op borstkanker
Shared-decision making gebaseerd op risicoprofiel

**ECHTE GEZONDHEIDSZORG & VALIDATIE MARKERS**

## BENEFITS OF A VIRTUAL CLINIC

Cost effective

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https://www.cloudbyz.com/resources/patient-recruitment/virtual-clinical-trial/

# DIT IS HET VERHAAL VAN EEN TEAM MET EEN MISSIE

CANCER GRAND CHALLENGES | Team: PRECISION

**Wesseling Group NKI-AVL**
*Associate Staff Scientist*
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*Project Management:*
Proteeti Bhattacharjee

*Postdocs:*
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Sandra van den Belt

*PhD students:*
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Merle van Leeuwen
Lot Mulder
Marte Liefaard
Mathilde Almekinders
Sena Alaeikhanehshir
Shannon Doyle
Marek Oerlemans
Will Harley

*Technical and data support:*
Lennart Mulder
Petra Kristel
Shiva Vonk
Yat-Hee Liu

**Molecular Pathology NKI**
Hugo Horlings Group
Marjanka Schmidt Group
Jacco van Rheenen Group
Jos Jonkers Group

**Imaging & AI NKI-AVL**
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Jonas Teuwen Group

**Surgical Oncology NKI-AVL**
Frederieke van Duijnhoven
Marie-Jeanne Vrancken-Peeters

**Medical Oncology NKI-AVL**
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Sabine Linn

**Epidemiology, HTA & Psycho-Oncology NKI-AVL**
Flora van Leeuwen
Eveline Bleiker Group
Valesca Rètel Group
Michael Schaapveld

**Bioinformatics NKI-AVL**
Tycho Bismeijer
Misha Sheinman
Lodewyk Wessels

**Clinical Project Manager**
Carine Sondermeijer

**Alumni Wesseling Group**
Lotte Elshof, Lindy Visser, Maartje van Seijen, Emilie Groen
Marlous Hoogstraat, Bert van der Vegt, Marnix de Roos

**CFMBP & Biobank bvn NKI-AVL**
Annegien Broeks, Dennis Peters, Ingrid Hofland

**Dutch National Pathology Data and Tissue Bank (PALGA)**
**Netherlands Cancer Registry**
**Numerous pathology labs!!!**

**Cancer Grand Challenge PRECISION**
PRECISION Patient Voices, UK & US & NL
Alastair Thompson, BCM, Houston, US
Elinor Sawyer, KCL, London, UK
Sarah Pinder, KCL, London, UK
Serena Nik-Zainal, Cambridge University, UK
Helen Davis, Cambridge University, UK
Andrew Futreal, MDACC, Houston, US
Nicholas Navin, MDACC, Houston, US
Shelley Hwang, Duke University, Durham, US
Fariba Behbod, Kansas University, US
Nick Stone, Exeter University, UK
Keith Rogers, Cranfield University, UK
Daniel Rea, Birmingham University, UK
Matthew Wallis, Cambridge University, UK

**DIRECT-DCIS PIs**
Esther Lips, NKI, Amsterdam, NL
Esther de Bekker-Grob, Erasmus MC, Rotterdam, NL
Valescal Rètel, Erasmus MC Rotterdam & NKI-AVL, NL
Peter Bosman, CWI Amsterdam & TU Delft, NL
Tanja Alderliesten, LUMC, Leiden, NL
Helena Verkooijen, Sofie Gernaat, UMC Utrecht, NL
Nanna Bos, NIVEL, Utrecht, NL

***DIRECT-DCIS Patient Representatives***
*Ellen Verschuur, BVN, Utrecht, NL*
*Marjolein Scholten, BVN, Utrecht, NL*

***DIRECT-DCIS Private Partners***
*Screenpoint Medical (Nico Karssemeijer)*
*DEARhealth (Katinka de Korte)*
*IQVIA – CTcue (Jacqueline Hartgerink)*

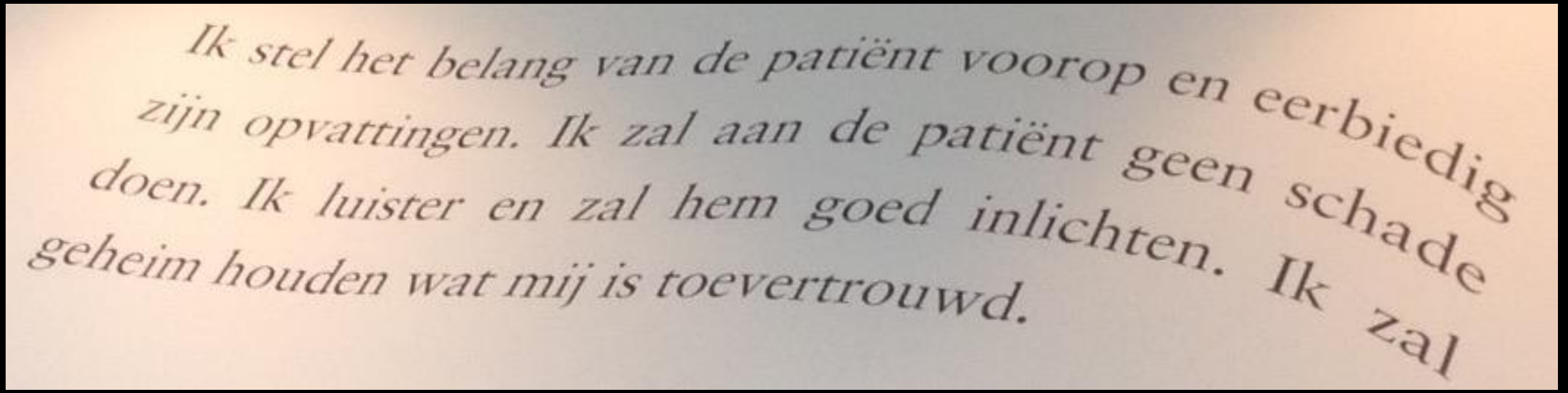
**Others**
Joyce Sanders, Erik Hooijberg, Rianne van der Linden, Koen van de Vijver, National Pathology Database (PALGA), Dutch Cancer Registry (IKNL), Dutch screening organization (RIVM), Dutch Breast Cancer Study Group (BOOG), EORTC HQ

# IMPACT DANKZIJ PATIËNTENVERTEGENWOORDIGERS





- Posters
- Co-auteur publicaties
- Samenvattingen voor leken
- Nieuwsbrieven
- Website




*'Primum, nil nocere' (Hippocratic Oath at the entrance wall of Domus Medica, Utrecht, the Netherlands)*