

# Al to improve the lives of patients

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## **Disclosures & Disclaimers**

Research collaborations incl. funding, consultancy and speaker honoraria

- Pharma: Roche, Johnson & Johnson, Bristol-Myers
   Squibb
- MedTech: Varian Medical Systems, Siemens, Philips, Sohard, Mirada Medical, ptTheragnostics, OncoRadiomics
- Health insurance: CZ Health Insurance

#### Spin-offs and commercial ventures

- MAASTRO Innovations B.V.
- Medical Data Works B.V.

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 Various patents on medical machine learning & Radiomics

### Public research funding

- Radiomics (USA-NIH/U01CA143062),
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- PROTRAIT&TraIT2HealthRI (NL-KWF)
- Data4LifeSciences (NL-NFU)
- Digital Society Agenda Health&Well-Being (NL-VSNU)



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# **Predicting the survival of NSCLC patients**







## Prediction of individual outcomes - making individual decisions is hard





Clinical Evidence. Settings or their effe J Clin Oncol 2010;28:4268 JMI 2012 Friedman, Rigby BMJ Clinical Evidence Oberifiedet allter Radflofther Official States Agency

- Explosion of data
- Explosion of decisions
- Explosion of 'evidence'
  - Too much to read
  - 3 % in trials, bias, multimorbid patients, grey areas
  - De-escalation trials
  - Sharp knife (e.g. technology)



Effectiveness of 3000 treatments as reported in randomised controlled trials selected by Clinical Evidence. This does **not** indicate how oftentreatments are used in healthcare settings or their effectiveness in individual patients.



# Potential of Big Data & Artificial Intelligence Learning Health Care System – Faster Innovation Real world & Registry based trials







Classified as internal/staff & contractors by the European Medicines Agency

# **Barriers to sharing data**

[..] the problem is not really technical [...]. Rather, the problems are **ethical, political, and administrative**.

Lancet Oncol 2011;12:933

- 1. Administrative (I don't have the resources)
- 2. Political (I don't want to)
- 3. Ethical (I am not allowed to)
- 4. Technical (I can't)







# A different approach

- If sharing is the problem: Don't share the data
- If you can't bring the data to the research
- You have to bring the research to the data
- Challenges
  - The research application has to be distributed (trains & track)
  - The data has to be understandable by an application (i.e. not a human) -> FAIR data stations



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## **Big Data & AI for Better Cancer Care**







### Small Cell Lung Cancer – Shared Decision Making – Grey Area Guideline



 

 AGEA

 Short survival - no PCI?

 Experience patient: Decisional Conflict, Control Preference, SDM

 Experience MD, SDM

 Experience MD, SDM

 Experience MD, SDM

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### Another grey area?



From NL data, we can predict survival in high dose RT

















• Rethink low dose treatments in good prognosis patients







### What did NL learn?

- Rethink low dose treatments in good prognosis patients
- Rethink high dose treatments in poor prognosis patients





# **Proton Therapy – Model Based Indication**





3 proton therapy centres in NL 1.600 slots and 50.000 patients 10.000€ -> 35.000€ No evidence Who gets it?

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Pipeline A





# Challenges



- Trust in model vs own expertise
- Usefulness of models
- Time pressure, workflow, patient cognition
- Evidence level and methodology
- Bad news, over-optimism

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- Nothing new, real trial competition
- Continuous changing models, regulatory
- Deviations from guidelines
- Political / market pressure (e.g. loss of patients)



# **Challenges**

 the guardian

 home > tech
 US politics world opinion sports soccer arts lifestyle fas ≡ all

 Tesla

 Tesla driver dies in first fatal crash while using autopilot mode

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#### Netherlands

MAASTRO, Maastricht, Netherlands Radboudumc, Nijmegen, Netherlands Erasmus MC, Rotterdam, Netherlands Leiden UMC, Leiden, Netherlands Catharina Hospital, Eindhoven, Netherlands Isala Hospital, Zwolle, Netherlands NKI Amsterdam, Netherlands UMCG, Groningen, Netherlands IKNL, Utrecht, Netherlands

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#### South America

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#### Australia

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#### Industry

Varian, Palo Alto, CA, USA Philips, Bangalore, India Sohard GmbH, Fuerth, Germany Microsoft, Hyderabad, India Mirada Medical, Oxford, UK CZ Health Insurance, Tilburg, NL Siemens, Malvern, PA, USA Roche, Woerden, NL Medical Data Works, Heerlen, NL







# Thank you for your attention