FUNDACION MARIE CURIE
Córdoba - Argentina

Congreso sobre Avances Integrados en Oncología, Radiocirugía y Física Médica: Innovación y Precisión en el tratamiento del cancer

Aplicación de IA en el manejo del cáncer de mama:

Toolbox-3

Philip Poortmans, MD, PhD

Iridium Netwerk & Antwerp University, Antwerpen (B)

Former President

Conflict of interest

Affidea – medical advisor

MSD - consultant

And I worry about the future…


STOP
WARS

Artificial intelligence in BC management – TB-3

- Introduction
- The ToolBox-3 project
- TB-3 outcomes
- What about radiation oncology?
- Some critical notes
- Conclusions

AI in BC – ToolBox-3: *Introduction*

Hace 8 años…

Name Philip Poortmans

Institute *Institut Curie, Paris, France*

This house believes that 20 years from now, due to the advances in technology, the need for human input in radiotherapy will be minimal.

Against the motion: There will still be a considerable need for human input in radiotherapy despite the technological advances.

AI in BC – ToolBox-3: *Introduction*

PubMed®

(artificial intelligence[Title/Abstract]) AND (breast cancer[Title/Abstract])

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RESULTS BY YEAR

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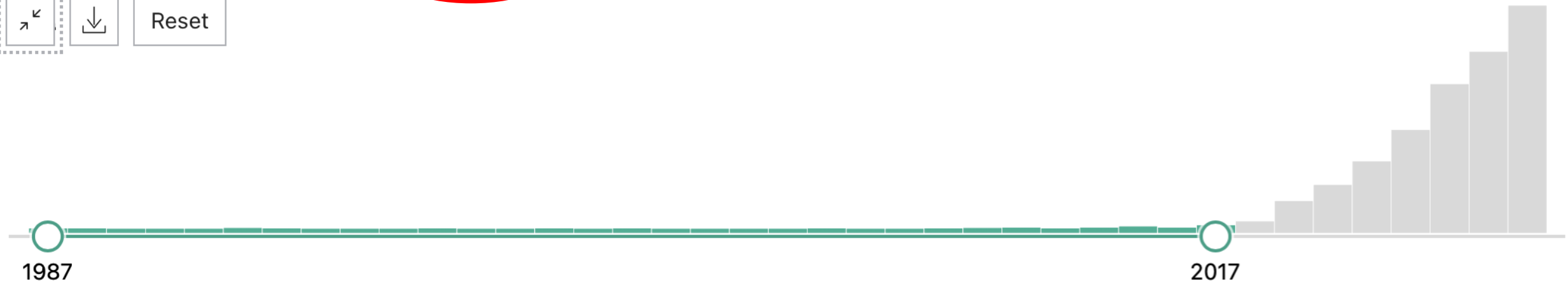

AI in BC – ToolBox-3: *Introduction*

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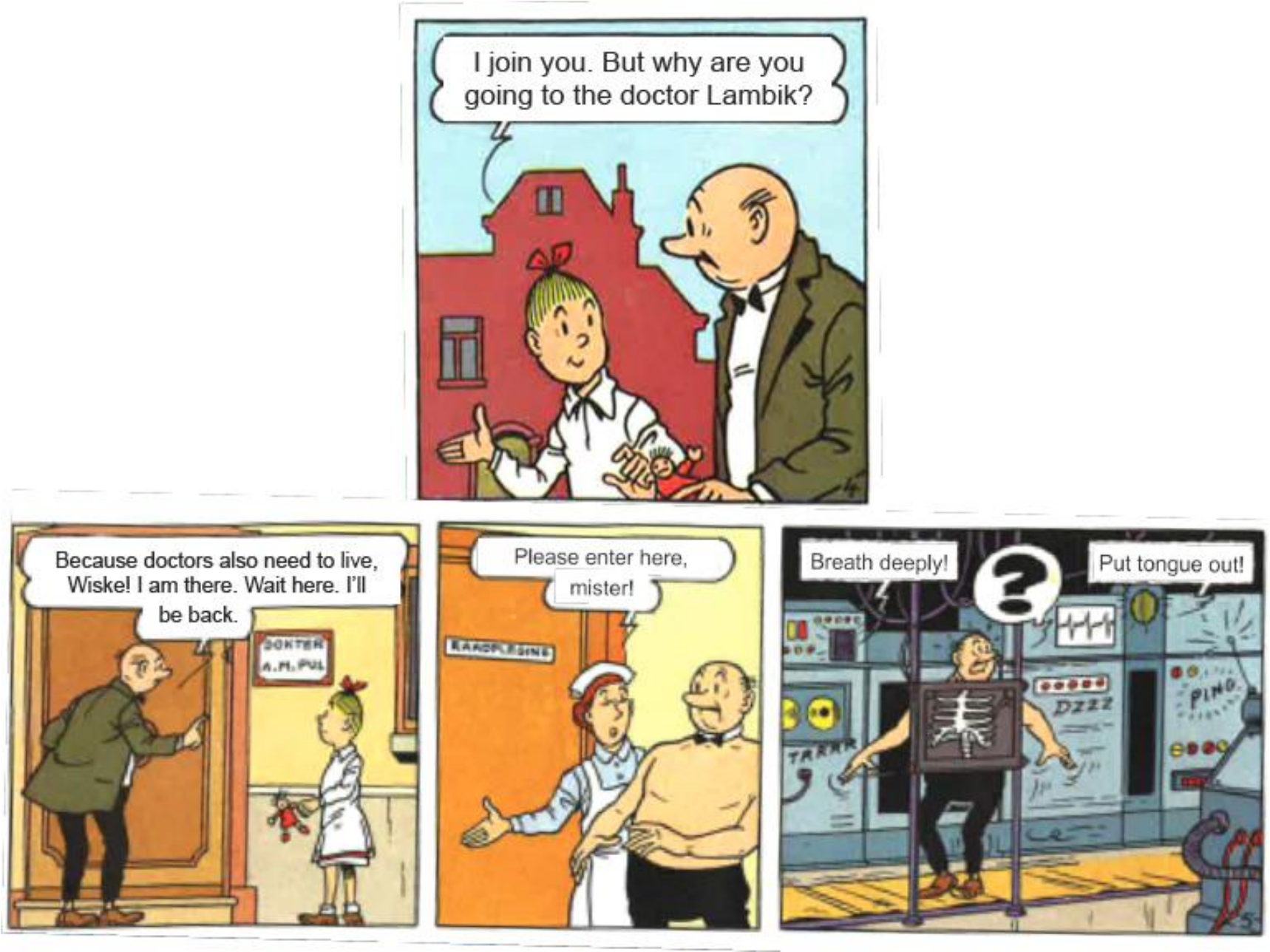

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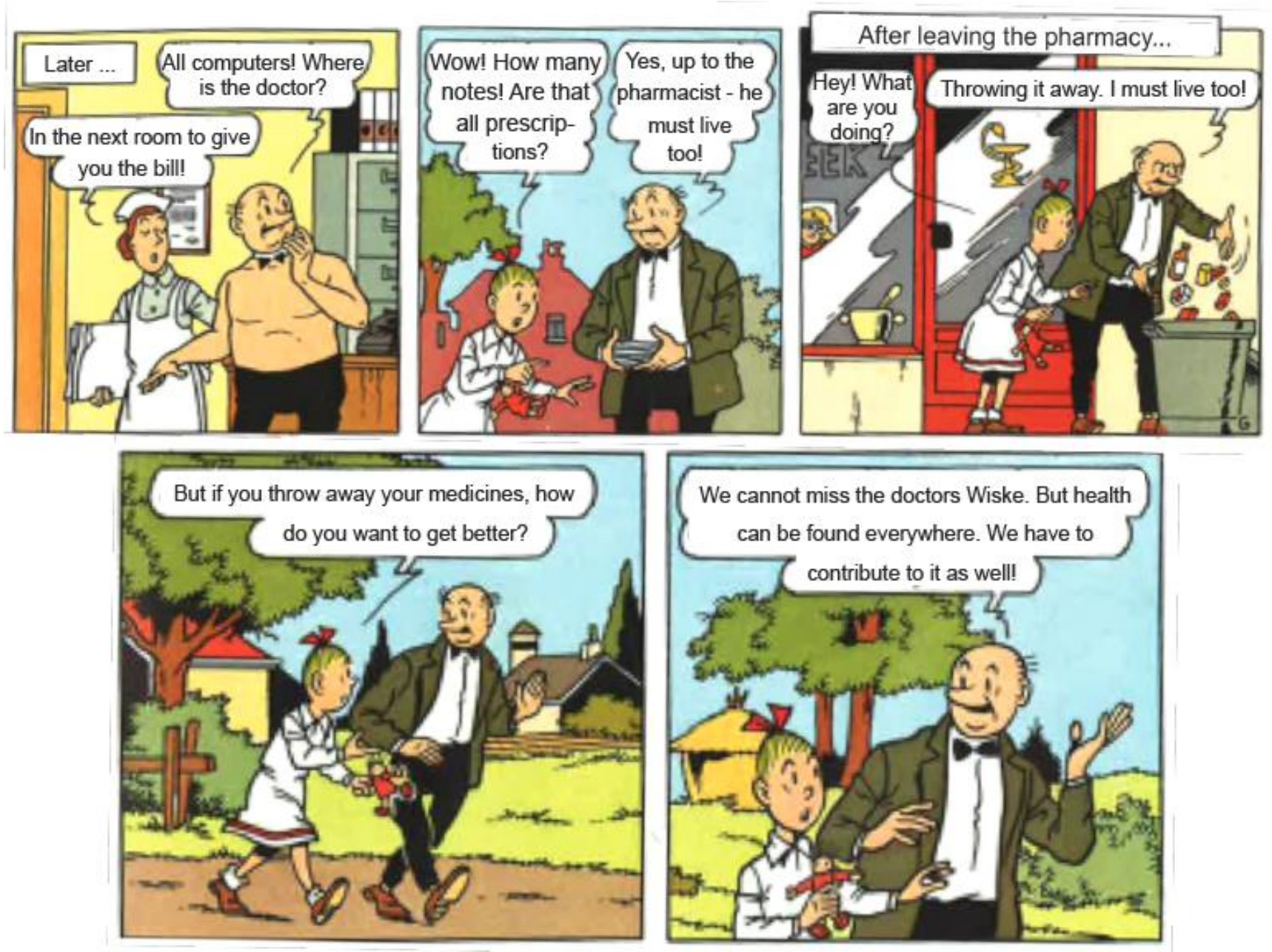

Hace 2 años…

Automatization in volume contouring:

Present and future

Philip Poortmans, MD, PhD

Iridium Netwerk & Antwerp University, Antwerpen (B)

Former President

AI in BC – ToolBox-3: *Introduction*

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RESULTS BY YEAR

964 results

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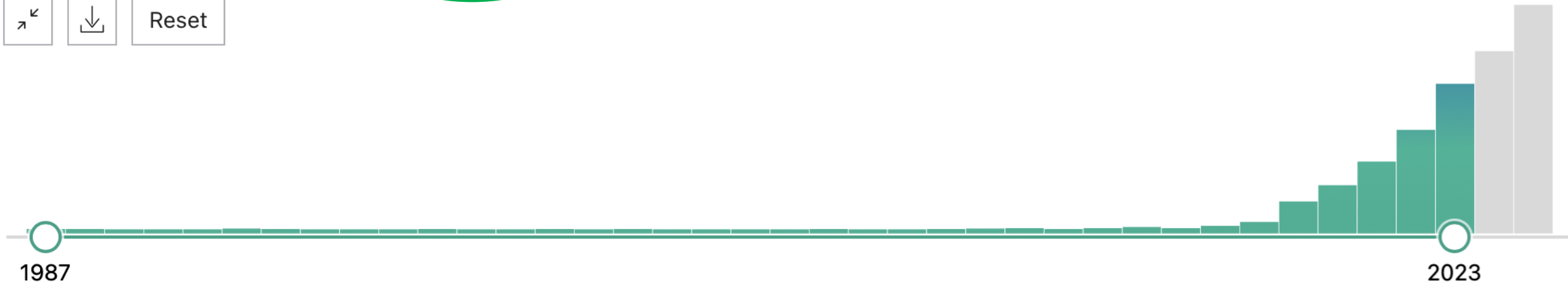

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Aplicación de IA en el manejo del cáncer de mama:

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Hoy en día…

Philip Poortmans, MD, PhD

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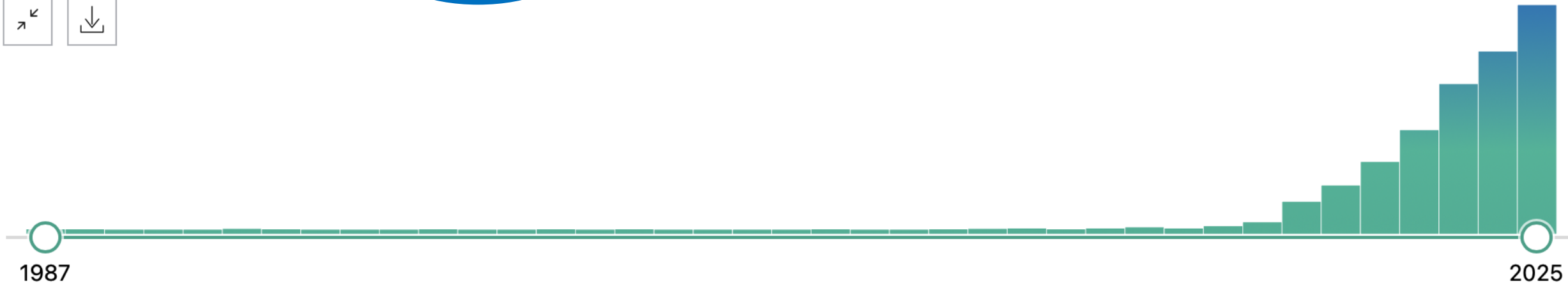
RESULTS BY YEAR

1,916 results

Page 1 of 192



AI in BC – ToolBox-3: *Introduction*

THELANCETONCOLOGY-D-25-00723R2

S1470-2045(25)00463-2

Embargo: [add date when known]

Doctopic: Review and Opinion

PubMed List

25TLO0723

Review

Embargo until publication on 24-11-2025

The Lucerne Toolbox 3: digital health and artificial intelligence to optimise the patient journey in early breast cancer—a multidisciplinary consensus

André Pfob; Katja Pinker, Ines Vaz-Luis, Antonio Di Meglio, Maria João Cardoso, Giuseppe Curigliano, Oreste Davide Gentilini, Günther Gruber, Nik Hauser, Jörg Heil; Orit Kaidar-Person, Michael Knauer, Han-Byoel Lee, Sae Byul Lee, Sherene Loi, Meinrad Mannhart, Stella Mastora, Icro Meattini, Rosa Di Micco, Aurelia Noske, Fedro Alessandro Peccatori, Fiorita Poulakaki, Mattea Reinisch, Isabel T Rubio, Charlie Swanton, Christoph Tausch, Marie-Jeanne Vrancken Peeters, Jong Han Yu, Walter Paul Weber, Norman Zerbe, Philip Poortmans, Carsten Denkert, Ritse Mann, Suzette Delaloge, Peter Dubsky, for the Toolbox 3 Consortium

Bouganim N, et al. Breast Cancer Res Treat 2013;139:603–6.

AI in BC – ToolBox-3: *Introduction*

THELANCETONCOLOGY-D-25-00723R2

S1470-2045(25)00463-2

25TLO0723

Review

Embargo until publication on 24-11-2025

Bouganim N, et al. Breast Cancer Res Treat 2013;139:603–6.

The Toolbox consortium

Brustzentrum Heidelberg
Klinik St. Elisabeth

- Provide detailed **guidance for the multidisciplinary treatment** team
- at **all stages of the patient journey** from diagnosis to surgery and irradiation including adjuvant treatments
- based on **high-level clinical evidence** when available and **expert consensus** when required

Slide courtesy André Pfob & Peter Dubsky

Toolbox 1: Locoregional after PST

Brustzentrum Heidelberg
Klinik St. Elisabeth

Panel 1: **Overview of working packages**

Working package 1 (appendix pp 3–4)
Basic requirements: multidisciplinary team meetings and patient visits with clinical specialists

Working package 2 (appendix pp 5–8)
Diagnostic assessment of patients planned for primary systemic therapy: pathology, imaging, and marking of breast and axilla at diagnosis

Working package 3 (appendix p 9)
Tumour response to primary systemic therapy: optimal timepoints and modalities of response assessments

Working packages 4 and 5 (appendix pp 10–14)
Preoperative surgical plan and preoperative and intraoperative locational techniques for breast and axillary surgery

Working package 6 (appendix p 15)
Basic quality control and benchmarks, and patient reported outcomes

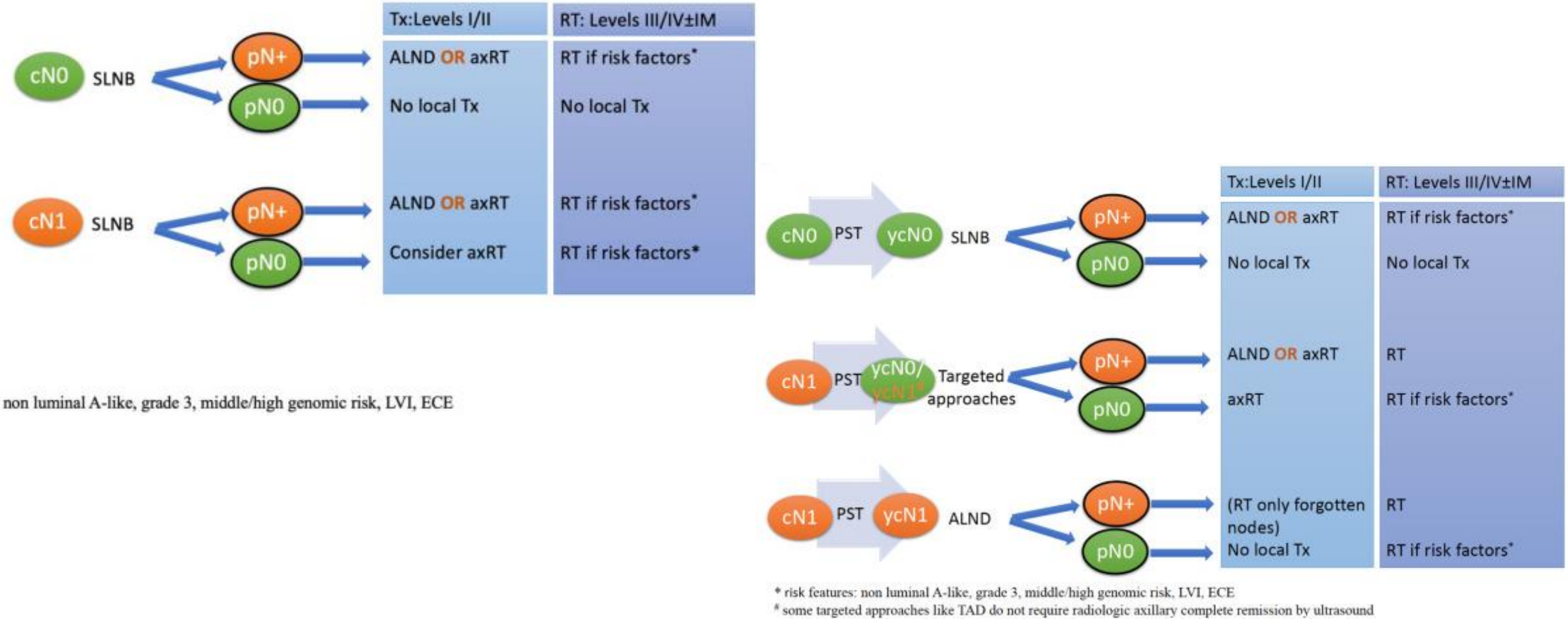
- Inclusion of all main European oncology societies and patient advocates involved in breast cancer treatment: ESSO, ESTRO, ESMO, ESO, EUROPADONNA, EUSOBI, EUBREAST, OPBC
- Inclusion of key opinion leaders from major clinical trial groups: ABCSG, EORTC, GBG, IBCSG

Dubsky P, et al. Lucerne Toolbox - Breast conservation and axillary management after primary systemic therapy. Lancet Oncology. 2020
Kaidar-Person O, et al. Toolbox 2 to optimise axillary management. eClinicalMedicine. 2023

Slide courtesy André Pfob & Peter Dubsky

Toolbox 2: Axillary Management

Brustzentrum Heidelberg
Klinik St. Elisabeth



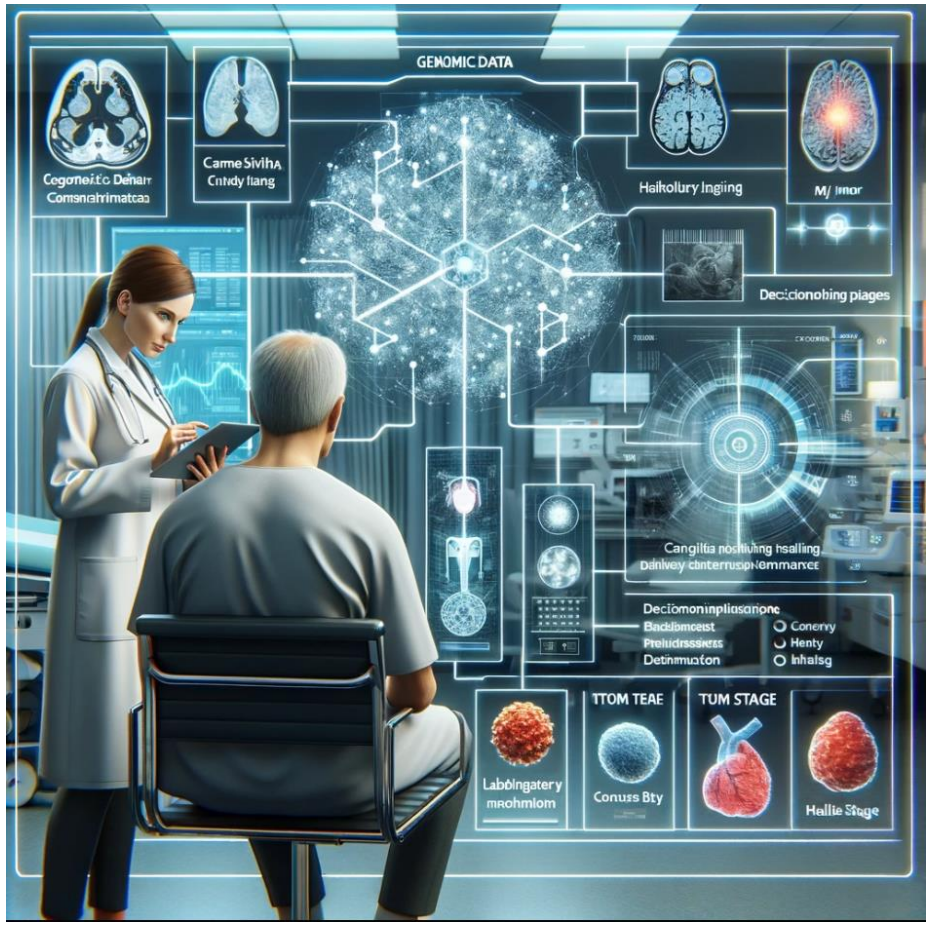
*Risk features: non luminal A-like, grade 3, middle/high genomic risk, LVI, ECE

* risk features: non luminal A-like, grade 3, middle/high genomic risk, LVI, ECE
* some targeted approaches like TAD do not require radiologic axillary complete remission by ultrasound

DubskyP, et al. Lucerne Toolbox - Breast conservation and axillary management after primary systemic therapy. Lancet Oncology. 2020

Kaidar-Person O, et al. Toolbox 2 to optimise axillary management. eClinicalMedicine. 2023

Toolbox 3: The Promises of AI in Oncology …



The promises of AI in oncology

- increase **care accessibility**
- increase **patient empowerment**
- improve **clinical outcomes**
- improve **quality of life …**

  … for patients AND clinicians

- provide **individualised care**
- increase **cost-effectiveness**

Labrique et al. Glob Health 2018; 14:1-8 | Hosny et al. Nat Rev Cancer 2018; 18:500-510 | Pfob et al. Ann Surg 2023; 277(1):E144–52
Basch et al. JAMA 2017; 318:197-198 | Pfob et al. J Clin Oncology 2022; 40(17):1903–15

… and the Reality

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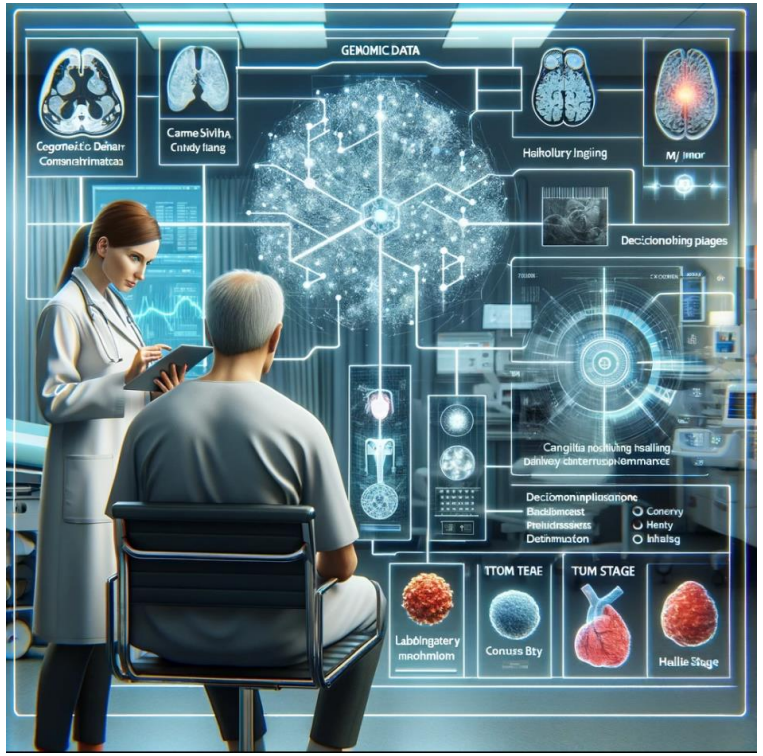
DALL·E



DALL·E

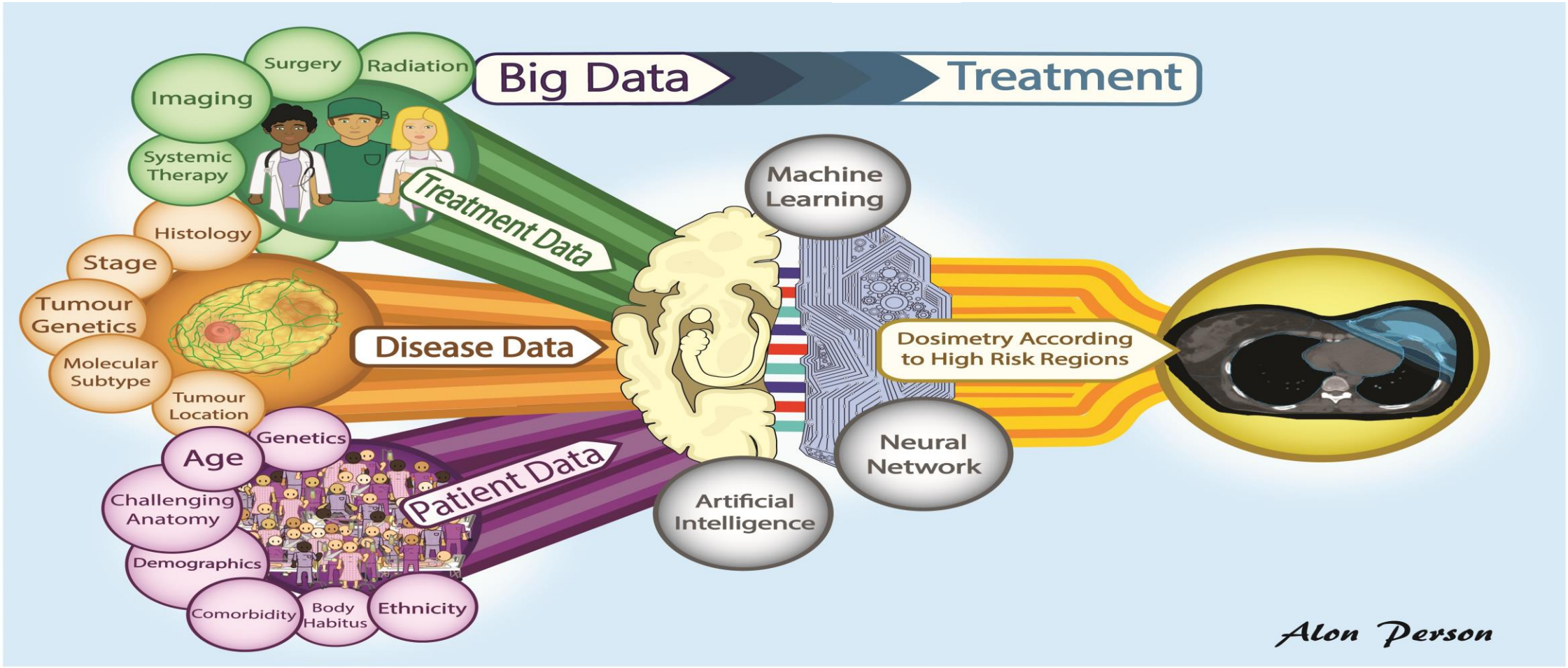
- heterogenous, analogue data in outdated clinical information systems
- lack of information flow across sectors | lack of patient-centered care
- lack of automated processes (guideline recommendations, tumorboards)

Pfob et al: Current landscape of hospital information systems in gynecology and obstetrics in Germany. Arch Gynecol Obstet 2023
Pfob et al: Status quo and future directions of digitalization in gynecology and obstetrics in Germany. Arch Gynecol Obstet 2023

AI in BC – ToolBox-3: *Introduction*

Winter is over: The use of Artificial Intelligence to individualise radiation therapy for breast cancer☆

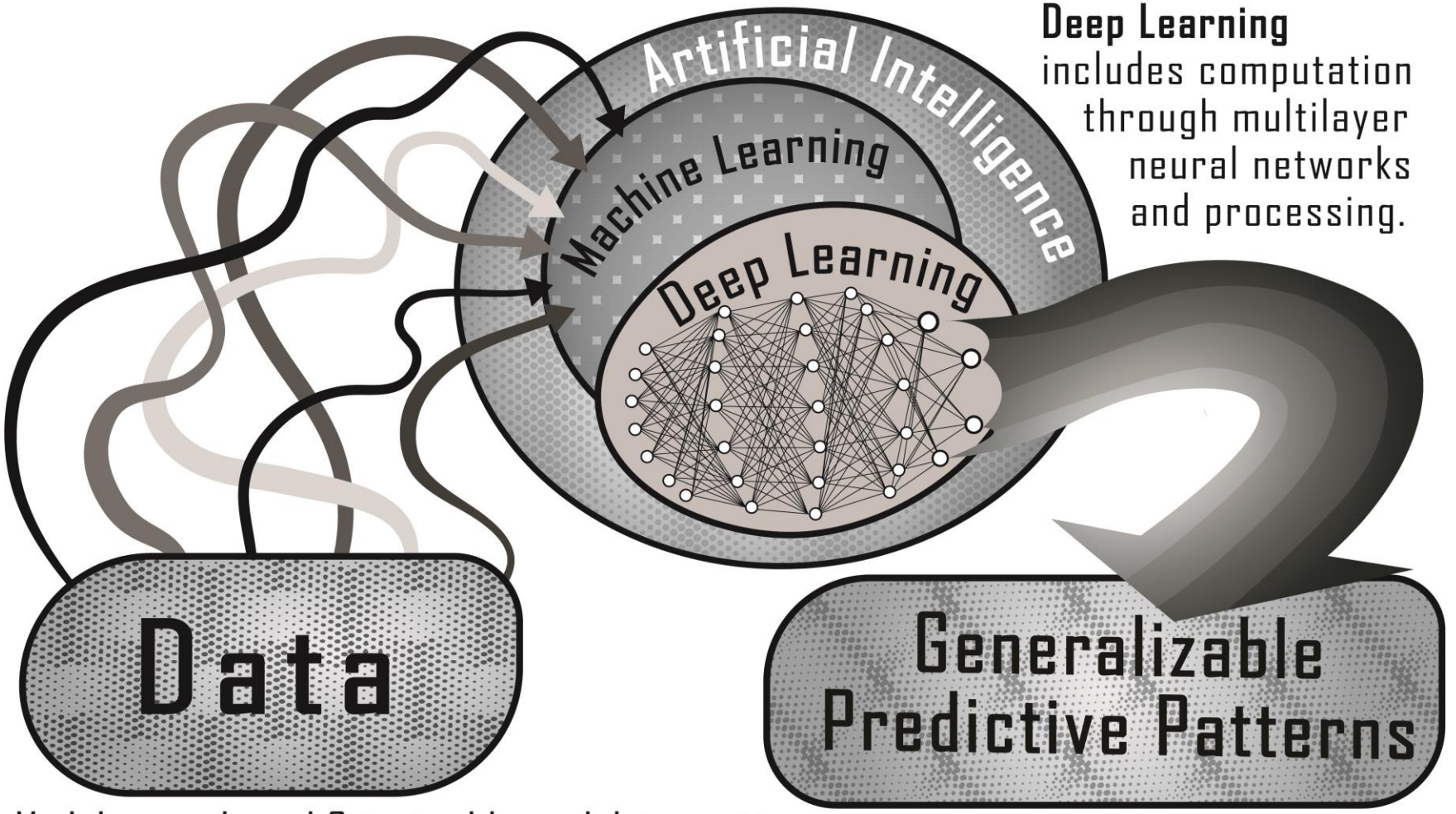
Philip M.P. Poortmans [a, *], Silvia Takanen [b], Gustavo Nader Marta [c, d], Icro Meattini [e, f], Orit Kaidar-Person [g]



Kaidar-Person O, et al. Breast. 2020 Feb:49:194-200.

AI in BC – ToolBox-3: *Introduction*

Illustration of position of deep learning (DL) vs machine learning (ML) & AI



Kaidar-Person O, et al. Breast 2025;83:104537.

Artificial intelligence in BC management – TB-3

- Introduction
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Knowledge Gap

Definition

- *Urgent need of knowledge to guide clinical practice and research*
- *opposed to knowledge of theoretical or purely scientific interest*

- *What is the performance of Artificial Intelligence-based breast cancer screening?*

Research Question

Operationalized question

- *follows PICO (patient, intervention, control, outcome) format*

- *P: For patients presenting for routine breast cancer screening,*
- *I: does AI-based breast cancer screening*
- *C: compared to routine breast cancer screening,*
- *O: detect as many cancers?*

Trial Design

Based on

- *methodological quality (level of evidence)*
- *feasibility*
- *applicability*

- *prospective RCT*
- *1:1 Randomization*
- *Primary outcome: cancer detection rate*
- *Follow-Up: 2 years*

Part 1

Part 2

Slide courtesy André Pfob & Peter Dubsky

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Research Question

- P — Patient / Population
- I — Intervention
- C — Comparison
- O — Outcome

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Slide courtesy André Pfob & Peter Dubsky

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Part 1

Part 2

Slide courtesy André Pfob & Peter Dubsky

Toolbox 3 – Knowledge gaps in digital breast cancer

DELPHI process

- Rank the importance of 54 knowledge gaps

Consensus conference

- Discuss and consent trial design to address knowledge gaps

Working Packages

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- WP 1: Diagnostic measures and screening
- WP 2: Surgery and surgical planning
- WP 3: Pathology
- WP 4: Systemic therapy
- WP 5: Radiation oncology
- WP 6: Post-primary treatment/ follow-up
- WP 7: General clinical pathway

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Results

	Overall (112)
Discipline – no. (%)	
Gynaecologist	11 (9.8%)
Medical Oncologist	12 (10.7%)
Pathologist	17 (15.2%)
Patient	18 (16.1%)
Radiation Oncologist	18 (16.1%)
Radiologist	18 (16.1%)
Surgeon	18 (16.1%)
Gender – no. (%)	
Female	65 (58.0%)
Male	46 (41.1%)
Prefer not to say	1 (0.9%)
Non-binary	0 (0%)

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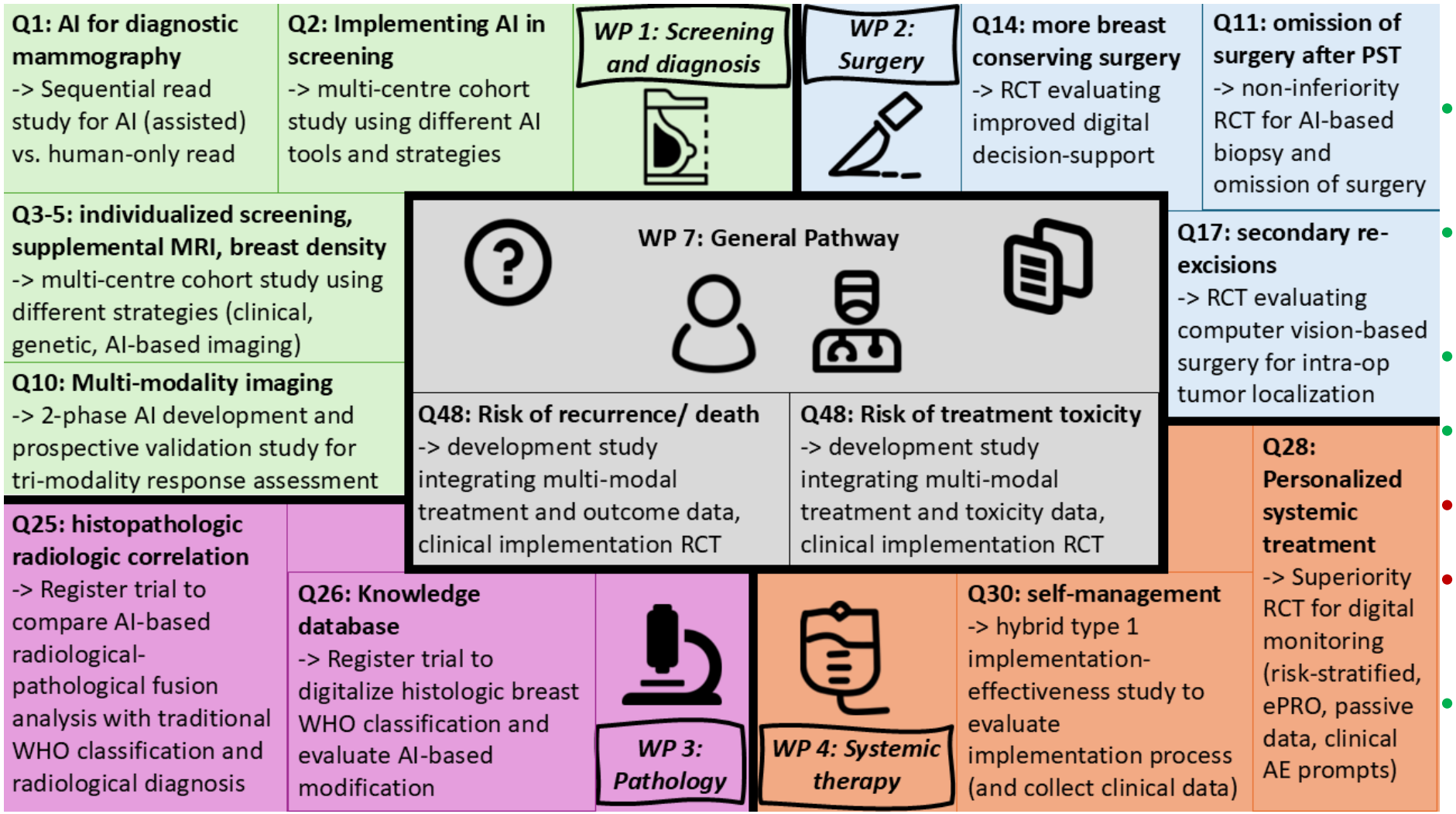
Unpublished data. Do NOT share.

Slide courtesy André Pfob & Peter Dubsky

Results



- WP 1: Diagnostic measures and screening
- WP 2: Surgery and surgical planning
- WP 3: Pathology
- WP 4: Systemic therapy
- **WP 5: Radiation oncology**
- **WP 6: Post-primary treatment/ follow-up**
- WP 7: General clinical pathway

Unpublished data. Do NOT share.

Radiology

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- 6 of 15 (40%) top knowledge gaps

Question 1: Using AI for diagnostic mammography	
Design	(Within patient trial) sequential read study
Population	patients presenting for mammography/ digital breast tomosynthesis (DBT) in a diagnostic setting (i.e. symptomatic masses, findings in screening, history of BC)
Intervention	AI (-assisted) assessment of imaging
Comparison	Only human-based interpretation
Outcome	Co-primary: sensitivity, specificity; secondary: NPV, PPV, reading time

Unpublished data. Do NOT share.

Surgery

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- 3 of 15 (20%) top knowledge gaps

Question 11: AI to omit breast surgery after neoadjuvant treatment	
Design	non-inferiority RCT, 1:1 randomized into AI-based omission of surgery vs. SOC
Population	cT1-2, cN0-1, partial/complete response to neoadjuvant treatment on imaging (US or MRI), HER2+/TNBC/LumB Ki67≥40
Intervention	AI-based vacuum-assisted biopsy (+ whole breast Rx)
Comparison	SOC
Outcome	primary: 5-year iDFS; secondary: 5,10,20 -year OS / iDFS / DDFS, health economics, role of TILs/ CTCs, and multi-modal AI imaging for response monitoring

Unpublished data. Do NOT share.

Pathology

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- 2 of 15 (13%) top knowledge gaps

Question 26: Knowledge databases in pathology	
Design	Register trial to provide a comprehensive knowledge database for all histopathological lesions in breast pathology
Population	Patients with breast biopsy and histological diagnosis that is included in the current WHO classification.
Intervention	no intervention planned regarding patient treatment
Comparison	Comparison of AI-based structured analysis with the traditional WHO classification, Step 1: achieve concordance between AI and WHO, Step 2: use AI to modify the WHO classification, Step 3: Use the knowledge database to provide aid to pathologists in training as well as diagnosis of new samples
Outcome	Replacement of traditional pathology textbooks by a unified knowledge database, identification of difficult areas with current classification

Unpublished data. Do NOT share.

Systemic therapy

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- 2 of 15 (13%) top knowledge gaps

Question 30: Supporting self-management during systemic therapy	
Design	A hybrid type 1 implementation-effectiveness study. Effectiveness of intervention on clinical outcomes (symptom management and adherence) and gathering data on implementation processes (patient and provider acceptability, feasibility, and scalability of the digital health program).
Population	early breast cancer patients receiving systemic therapy
Intervention	self-management support program utilizing digital health tools (therapy-specific educational content, interactive tools for tracking and self-assessing symptoms, access to a self-care practice library, symptom management toolkit).
Comparison	SOC (no continuous symptom tracking or personalized management support)
Outcome	(Co)-Primary Outcome: improved adherence to systemic therapy and decreased healthcare utilization (unplanned clinical visits or hospitalizations)

Unpublished data. Do NOT share.

General clinical pathway

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- 2 of 15 (13%) top knowledge gaps

Question 48: Predicting overall risk of recurrence	
Design	development study based on trial data including multi-modal treatment and outcome data
Population	patients undergoing curative breast cancer treatment (including surgery, systemic therapy, radiation therapy)
Intervention	Prediction model of survival/recurrence, and added treatment benefit
Comparison	prior models (PredictBreast)
Outcome	model fit (discrimination, calibration scores), inform clinical implementation RCT (improved shared decision-making process)

Unpublished data. Do NOT share.

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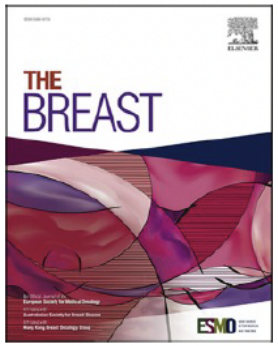
AI in BC – ToolBox-3: *Radiation oncology*

The Breast 83 (2025) 104537

Contents lists available at ScienceDirect

The Breast

journal homepage: www.journals.elsevier.com/the-breast



Artificial intelligence in breast cancer radiotherapy: Insights from the Toolbox Consortium Delphi study

Orit Kaidar-Person [a,b,*], André Pfob [c,d], Vincenzo Valentini [e], Marianne Aznar [f], Andre Dekker [g], Icro Meattini [h], Jana de Boniface [i,j], David Krug [k], Maria Joao Cardoso [l], Giuseppe Curigliano [m,n], Peter Dubsky [o,p], Philip Poortmans [q,r]

Kaidar-Person O, et al. Breast 2025;83:104537.

AI in BC – ToolBox-3: *Radiation oncology*

	Question # in the survey, the question received by participants	Mean Likert rating	Proportion of recommendations for research agenda
Target volume delineation			
33.	AI-based automatic delineation is already routinely used in some center. Does AI-based automatic delineation have a sufficient health technology assessment in radiation oncology? (If you think the technology assessment is not sufficient, you should rate this question as high/important)	6.46	9.09 %
34.	The identification of the target volume can differ substantially after different types of surgery. What is the role of AI-based tools for the detection of the target volume in breast cancer radiation oncology after breast-conserving surgery, mastectomy, oncoplastic surgery, and for nodal irradiation?	**6.96**	11.22 %
35.	Early research indicates that AI may help in the identification of residual breast or lymph node tissue after surgery. What is the development priority for AI-based tools to evaluate residual breast/lymph node tissue after mastectomy/ALND?	**6.95**	7.05 %

Kaidar-Person O, et al. Breast 2025;83:104537.

AI in BC – ToolBox-3: *Radiation oncology*

	Question # in the survey, the question received by participants	Mean Likert rating	Proportion of recommendations for research agenda
Treatment planning			
36.	Early research indicates that AI-based integromic approaches may help individualizing radiation therapy. How important is the investigation of AI-based, individualized integromic approaches (i.e. adaption of radiation oncology according to germline mutations, circulating tumor cells/DNA)	6.87	4.75 %
37.	Not every patient may need the same dosage or fractionation depending on tumor size, tumor biology etc. What is the development priority for digital decision support tools for individualized treatment planning with respect to dosage and fractionation?	**7.13**	19.76 %
38.	What is the role of digital decision support tools for individualized treatment selection with respect to indication for EBRT, adaptive RT, dose-guided RT, proton therapy, brachy, MR-linac?	6.48	4.26 %

Kaidar-Person O, et al. Breast 2025;83:104537.

AI in BC – ToolBox-3: *Radiation oncology*

Question # in the survey, the question received by participants		Mean Likert rating	Proportion of recommendations for research agenda
Evaluation of treatment plans			
39.	Prediction models exist to demonstrate the risk radiation therapy induced normal tissue complications as well as for the tumor control probability. Have AI-based models a preferred clinical utility, validity, and efficacy over NTCP and TCP models in breast cancer?	6.57	8.10 %
40.	Early research indicates that AI may help in prediction potential side effects. What is the development priority for AI-based risk assessment for potential side effects? E.g., inhomogeneity (inframammary fold, nipple)	6.75	2.62 %
41.	Early research indicates that AI may help in identifying areas that have not received a sufficient radiation dose. How important is the investigation of AI-based models to identify areas that are underdosed?	6.85	9.62 %

Kaidar-Person O, et al. Breast 2025;83:104537.

AI in BC – ToolBox-3: *Radiation oncology*

AI-based systems for BC auto-delineation

First author [Publication year]	System	Indication	Dataset cases	Volume of interest delineated	Subjective clinical evaluation (Need for corrections)	Contouring time saved with AI assistance	Quantitative evaluation	
Liu [2021]	RTD-Net	Post mastectomy	99	1 CTV (Breast)	99.3 %/98.9 % No or minor 0.7 %/1.1 % major[a]	50 %	Dice similarity coefficient and Hausdorff distance	0.9 5.65 mm
Almberg [2022]	RaySearch	Left breast whole breast Regional lymphatics	200	7 CTVs (Breast, L1-4, IMN, interpec) 11 OARs	14 % no 71 % minor 15 % major[b] 72 % no 26 % minor 2 % major	75 %		Only specific score per each volume reported
Liu [2021]	U-ResNet	Whole breast	160	1 CTV (Breast) 4 OARs	99.4 % no or minor 0.6 % major 95 % no 5 % major[a]	60 %		0.94 4.31 mm

Kaidar-Person O, et al. Breast 2025;83:104537.

AI in BC – ToolBox-3: *Radiation oncology*

AI-based systems for BC RT-planning

First author [Publication year]	System	Ability	Plan optimisation	Time	Comments
Court [2023]	RPA Compared to manual	Auto-delineation Planning	Tangential Field-in-field segments Supra field[a]	12 min time to edit autogenerated plan	accept around 50 %
Bakx [2023] van de Sande [2021]	RS Compared to 2 non-AI autoseg	Auto-delineation Planning	Tangential Field-in-field segments	Reduced	
Yoder [2019]	EZFluence[b]	Planning	Tangential Field-in-field segments	Reduced	Better dose optimisation Similar OAR dose

Kaidar-Person O, et al. Breast 2025;83:104537.

AI in BC – ToolBox-3: *Radiation oncology*

AI-based systems for BC auto-delineation

Clinical and Translational Radiation Oncology 49 (2024) 100855

Contents lists available at ScienceDirect

Clinical and Translational Radiation Oncology

journal homepage: www.sciencedirect.com/journal/clinical-and-translational-radiation-oncology

Validation of different automated segmentation models for target volume contouring in postoperative radiotherapy for breast cancer and regional nodal irradiation

Eva Meixner [a,b,c,d,*], Benjamin Glogauer [a,b], Sebastian Klüter [a,b], Friedrich Wagner [a,b], David Neugebauer [a,b], Line Hoeltgen [a,b,c], Lisa A. Dinges [a,b,c], Semi Harrabi [a,b,c,d], Jakob Liermann [a,b,c,d], Maria Vinsensia [a,b,c], Fabian Weykamp [a,b,c,d,e], Philipp Hoegen-Saßmannshausen [a,b,c,d], Jürgen Debus [a,b,c,d,e], Juliane Hörner-Rieber [a,b,c,d,e,f]

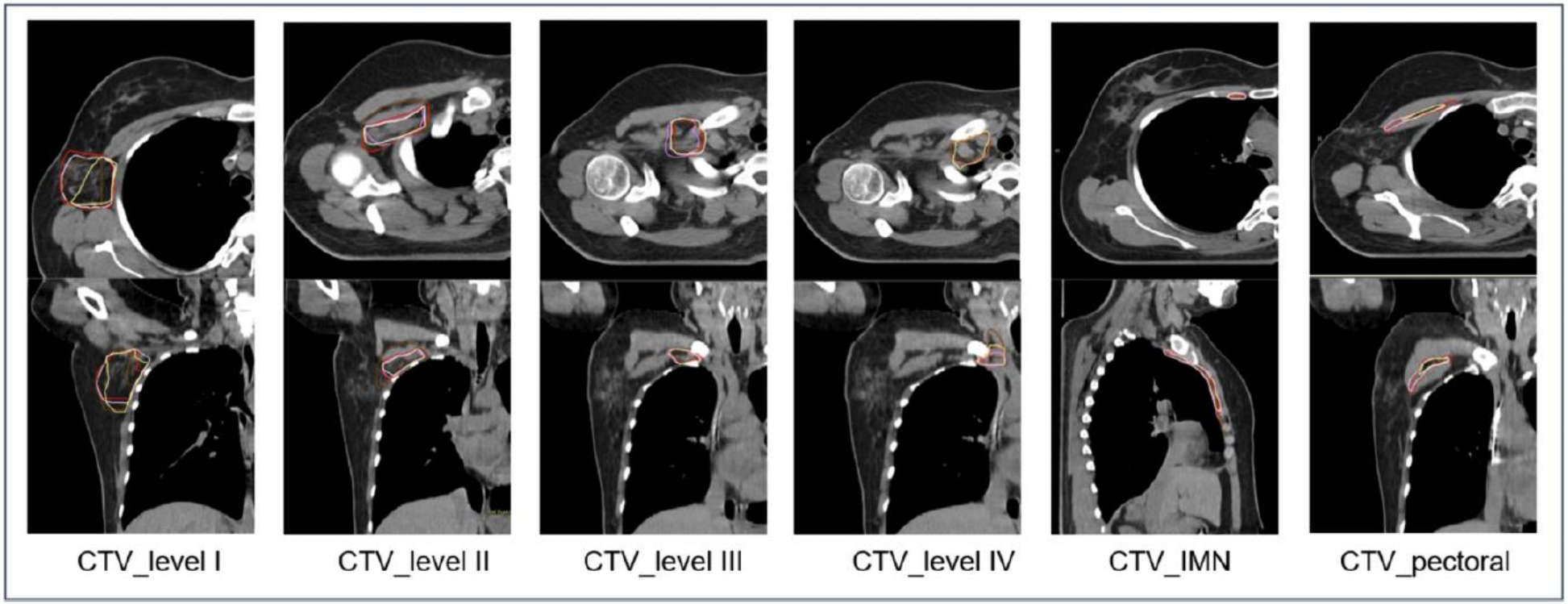
Meixner E, et al. ctRO 2024;49:100855..

AI in BC – ToolBox-3: *Radiation oncology*

AI-based systems for BC auto-delineation

- ✓ high-quality accuracy
- ✓ provide standardization & efficient support for guideline-based TV contouring

Next step: fully automated RT treatment planning workflow



Meixner E, et al. ctRO 2024;49:100855..

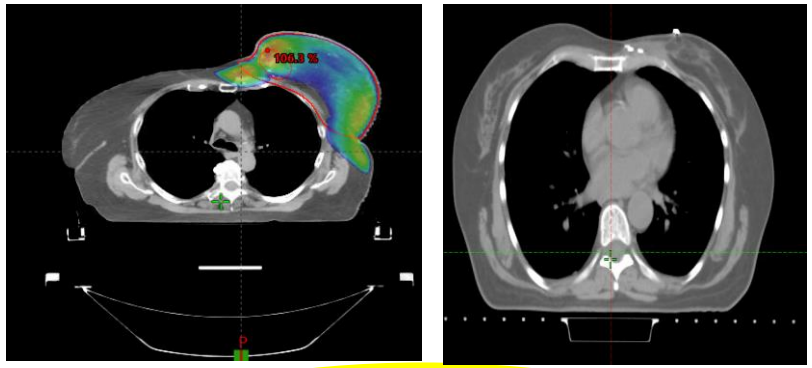
AI in BC – ToolBox-3: *Radiation oncology*

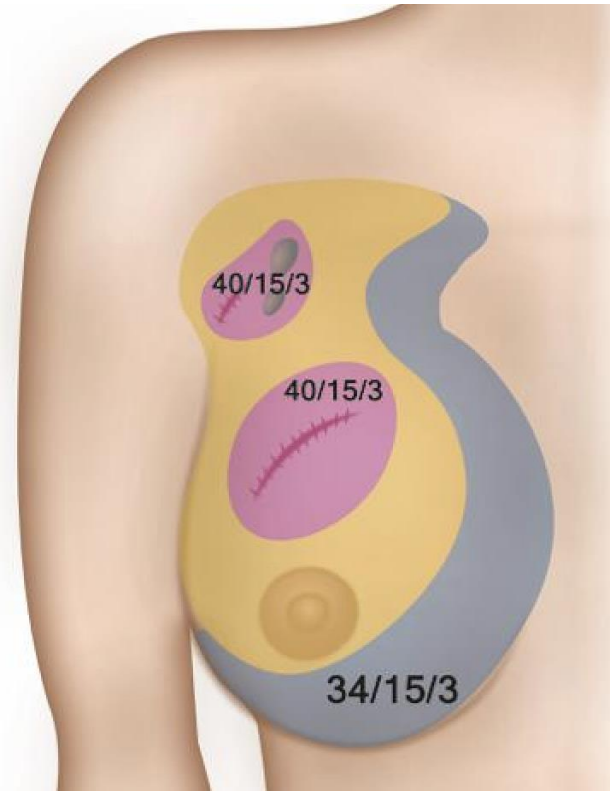
The *most* challenging **target volume** for breast irradiation is:

RT boost

(High risk)

Younger ≤ 40 yrs
Grade 3
Triple negative
Positive/close margins





Partial breast RT

(Low risk)

Reduces breast side effects with equivalent tumour control

Tumour bed

Slide courtesy Orit Kaidar-Person O.

A BRILLIANT-SECRET:

Identifying the high-risk volumes for local recurrence after mastectomy and breast reconstruction to guide postmastectomy radiation therapy

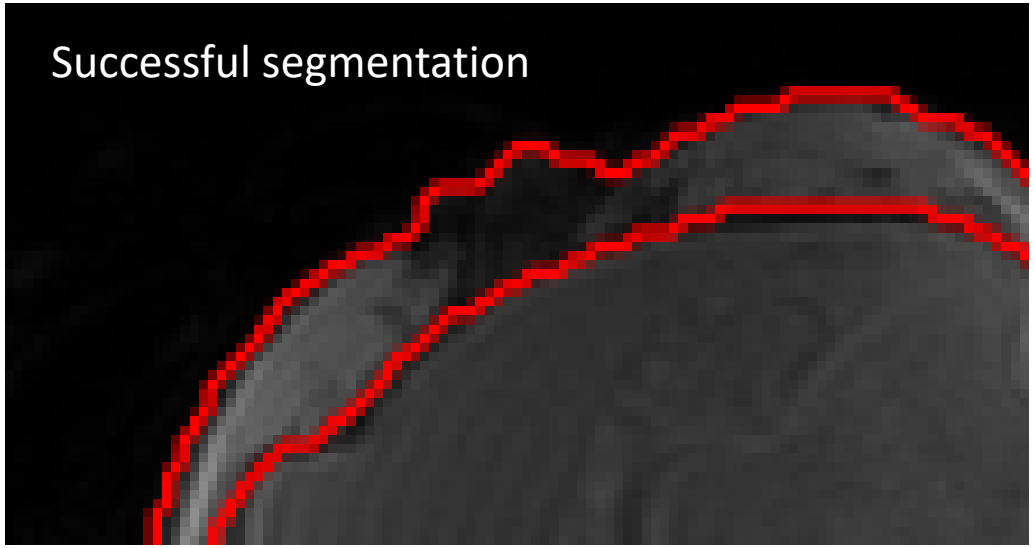
Philip Poortmans, MD, PhD

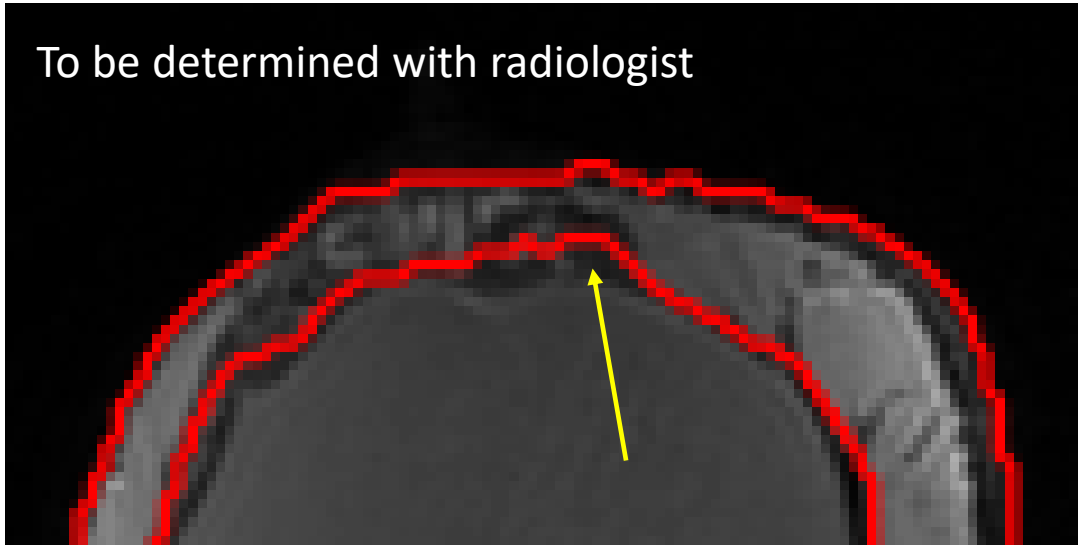
Iridium Netwerk & Antwerp University, Antwerpen (B)

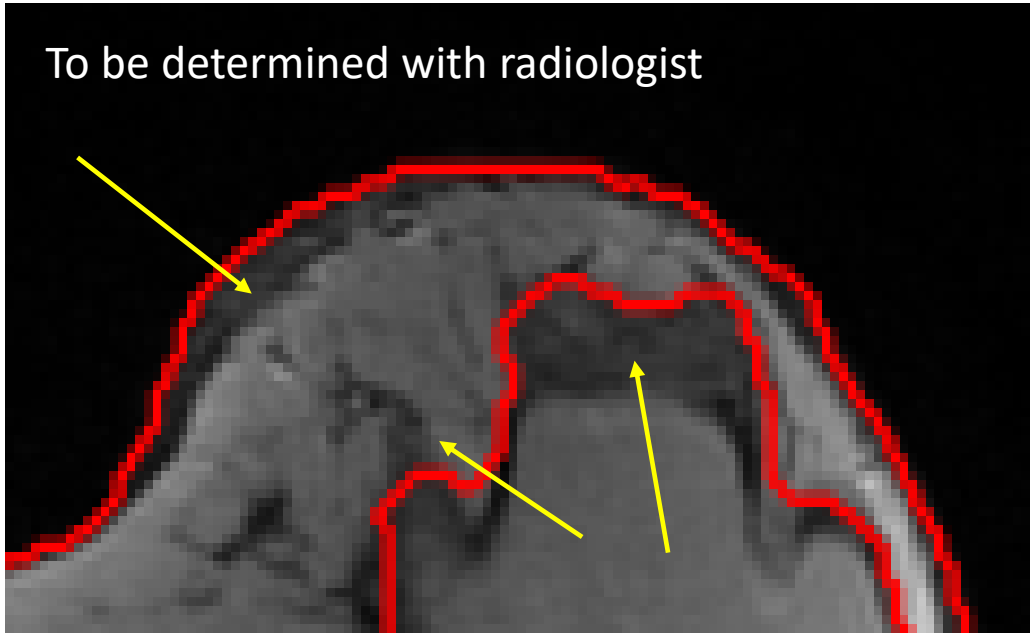
Former President

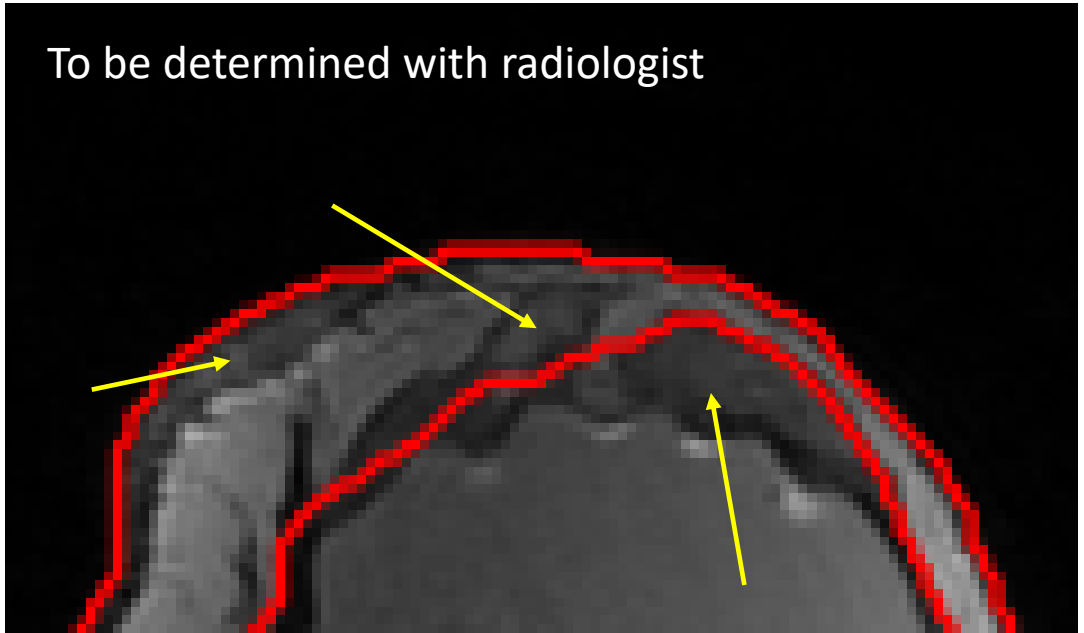
A Brilliant Secret: *BRILLIANT*

Ongoing work









Artificial intelligence in BC management – TB-3

- Introduction
- The ToolBox-3 project
- TB-3 outcomes
- What about radiation oncology?
- Some critical notes
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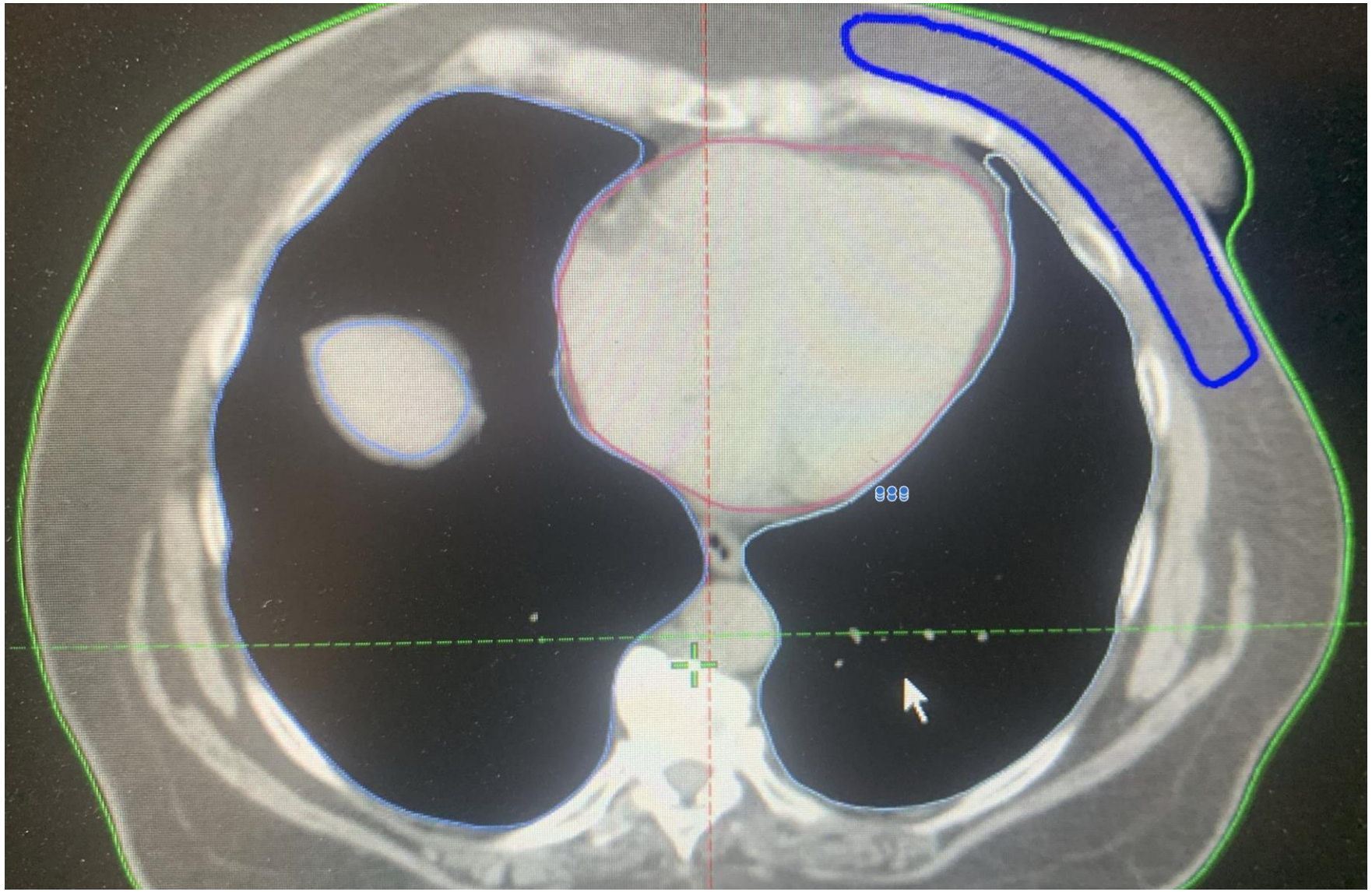
AI in BC – ToolBox-3: *Critical notes*

https://share.google/images/yBVZNKScK7qGawjrU

AI in BC – ToolBox-3: *Critical notes*

AI-based systems for BC auto-delineation



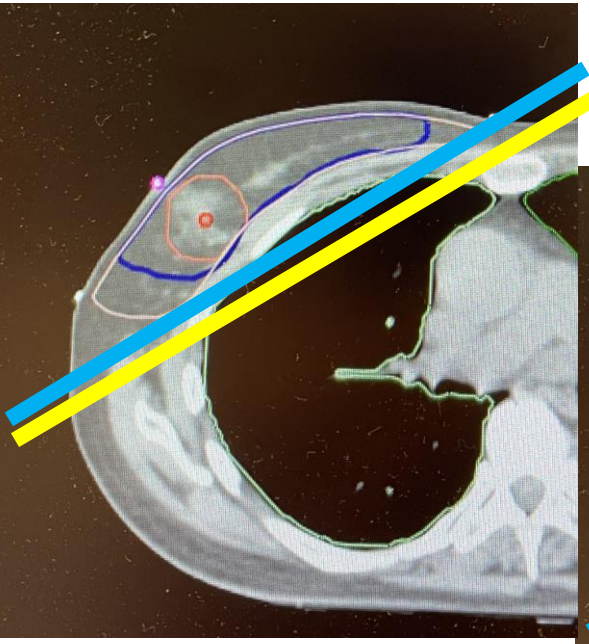
Courtesy Orit Kaidar-Person.

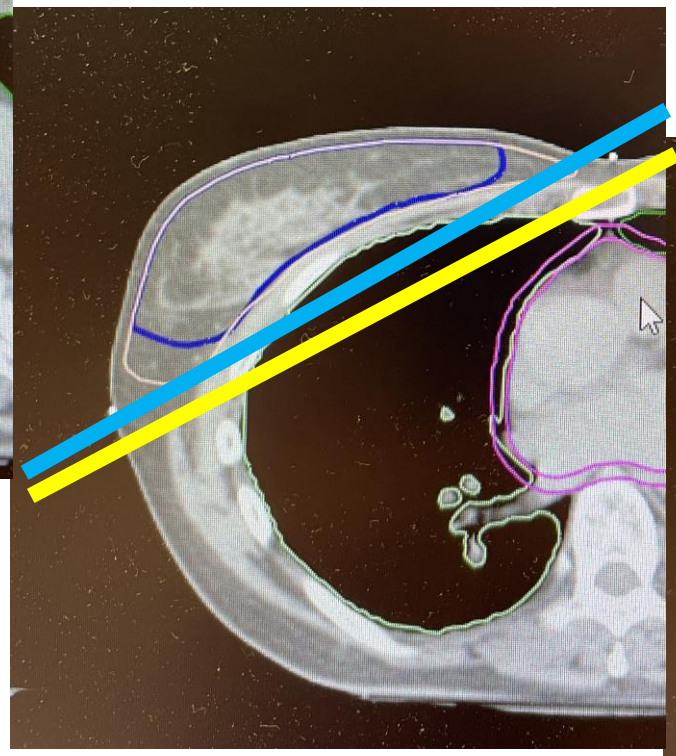
AI in BC – ToolBox-3: *Critical notes*

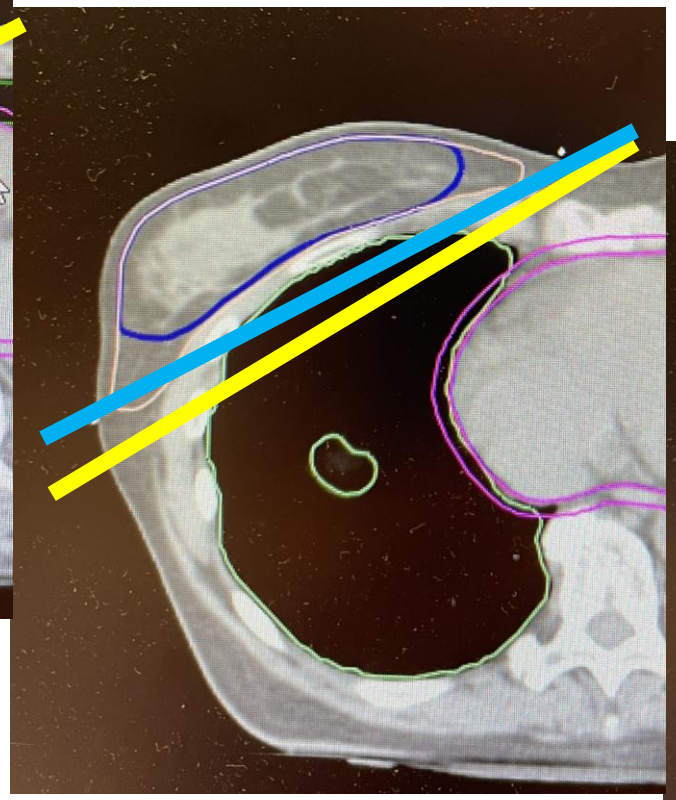
https://share.google/images/gzwIHGLxjHelSfqA3

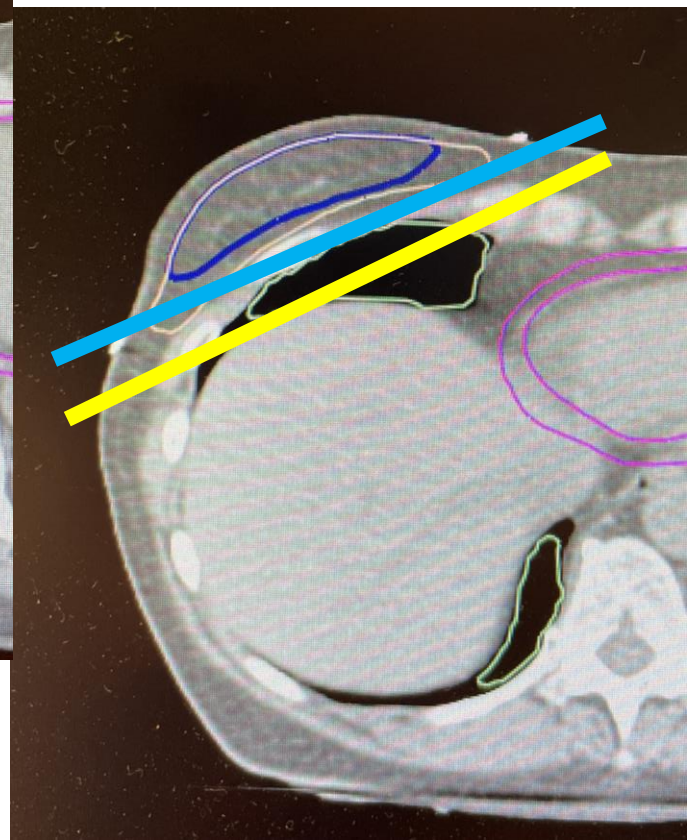
AI in BC – ToolBox-3: *Critical notes*

Contouring by resident vs expert







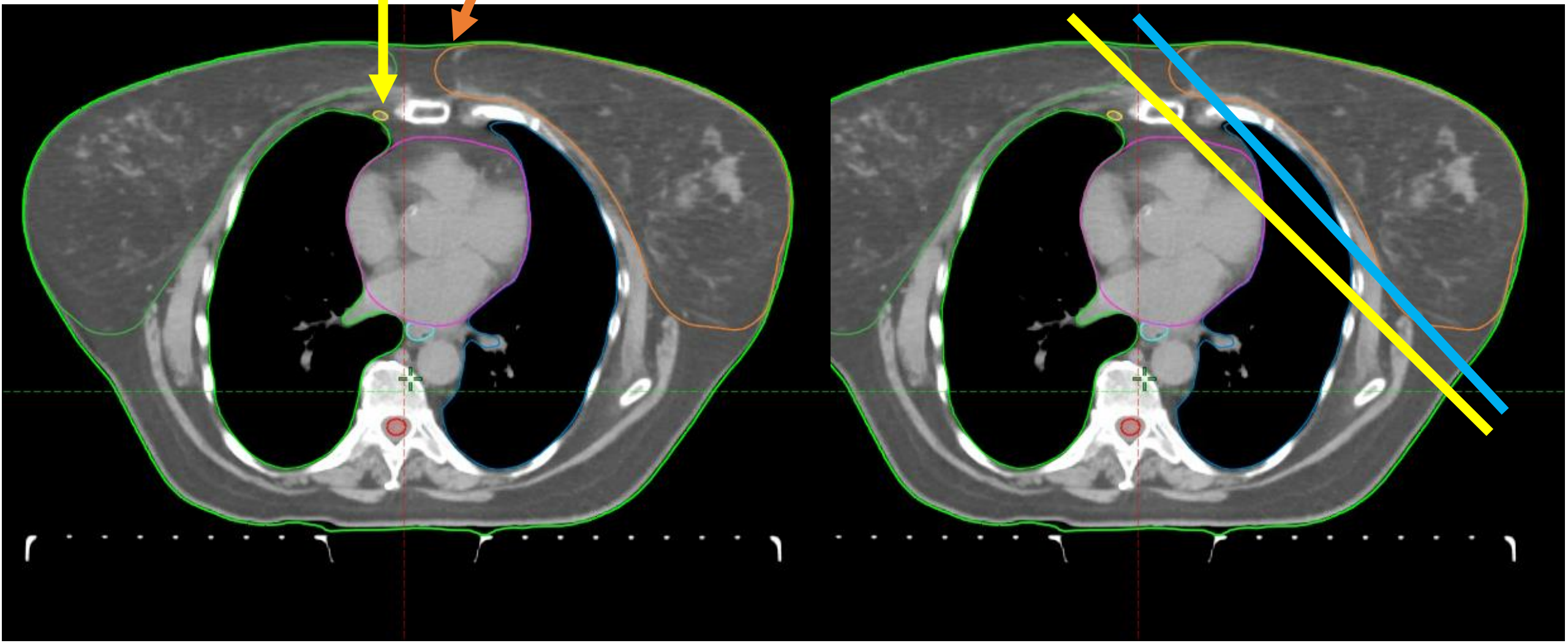


P.S. resident could have been DLC, often following wrong atlas = unreliable start…

Poortmans P, own experience

AI in BC – ToolBox-3: *Critical notes*

ABAS – wrong atlas (RTOG = field-based = 20th century)



Slide courtesy Orit Kaidar-Person.

AI in BC – ToolBox-3: *Critical notes*

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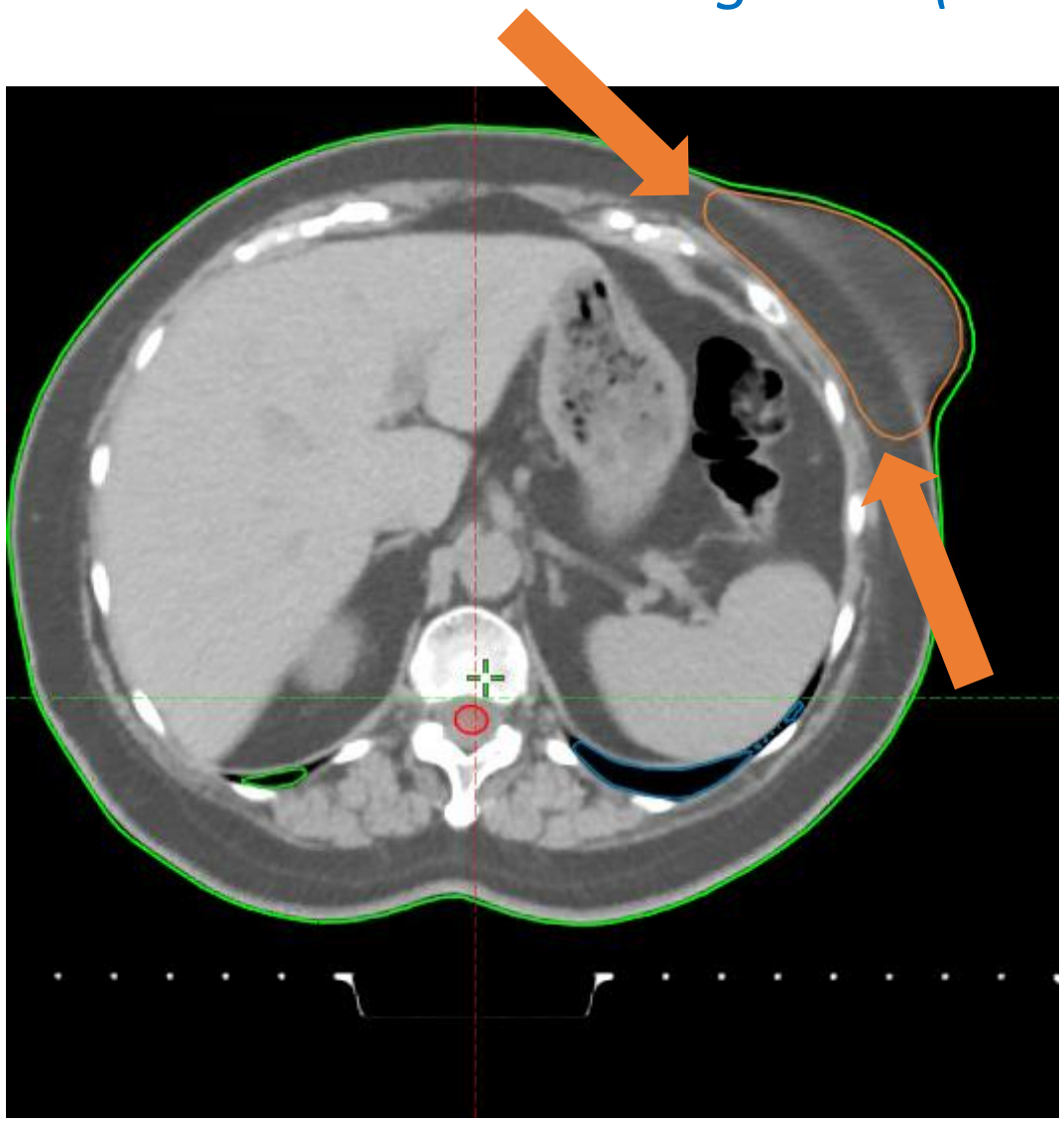
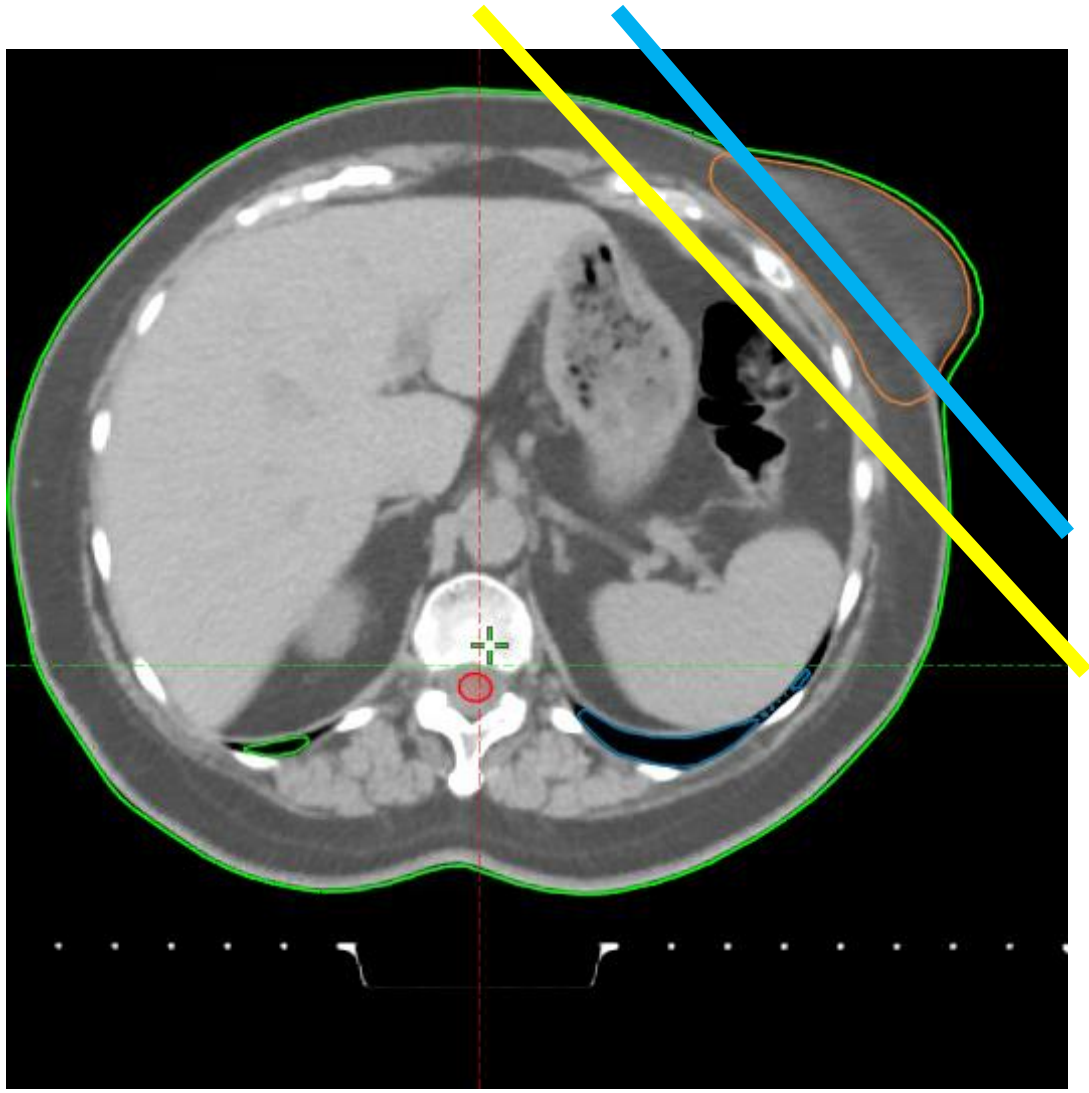
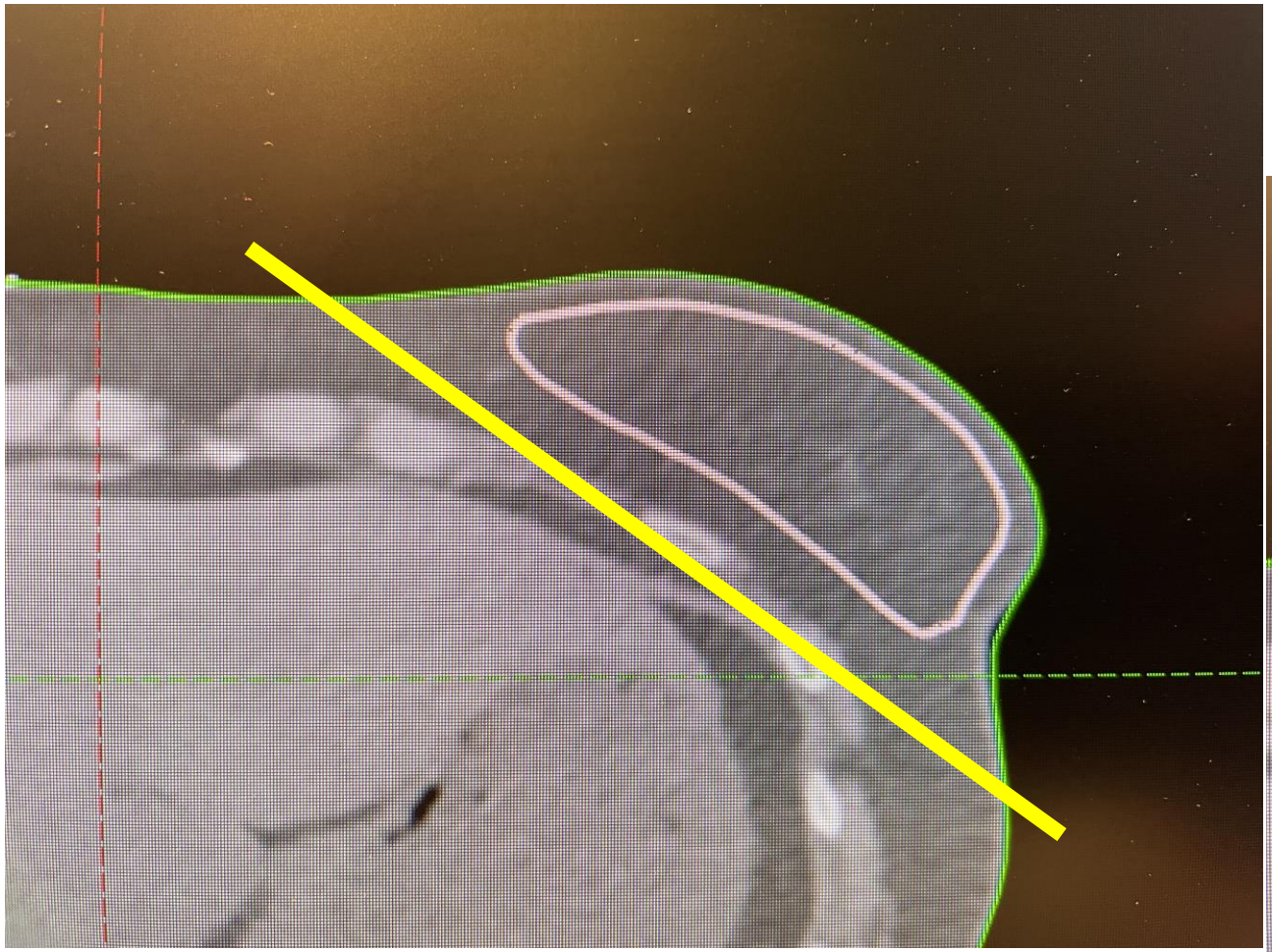


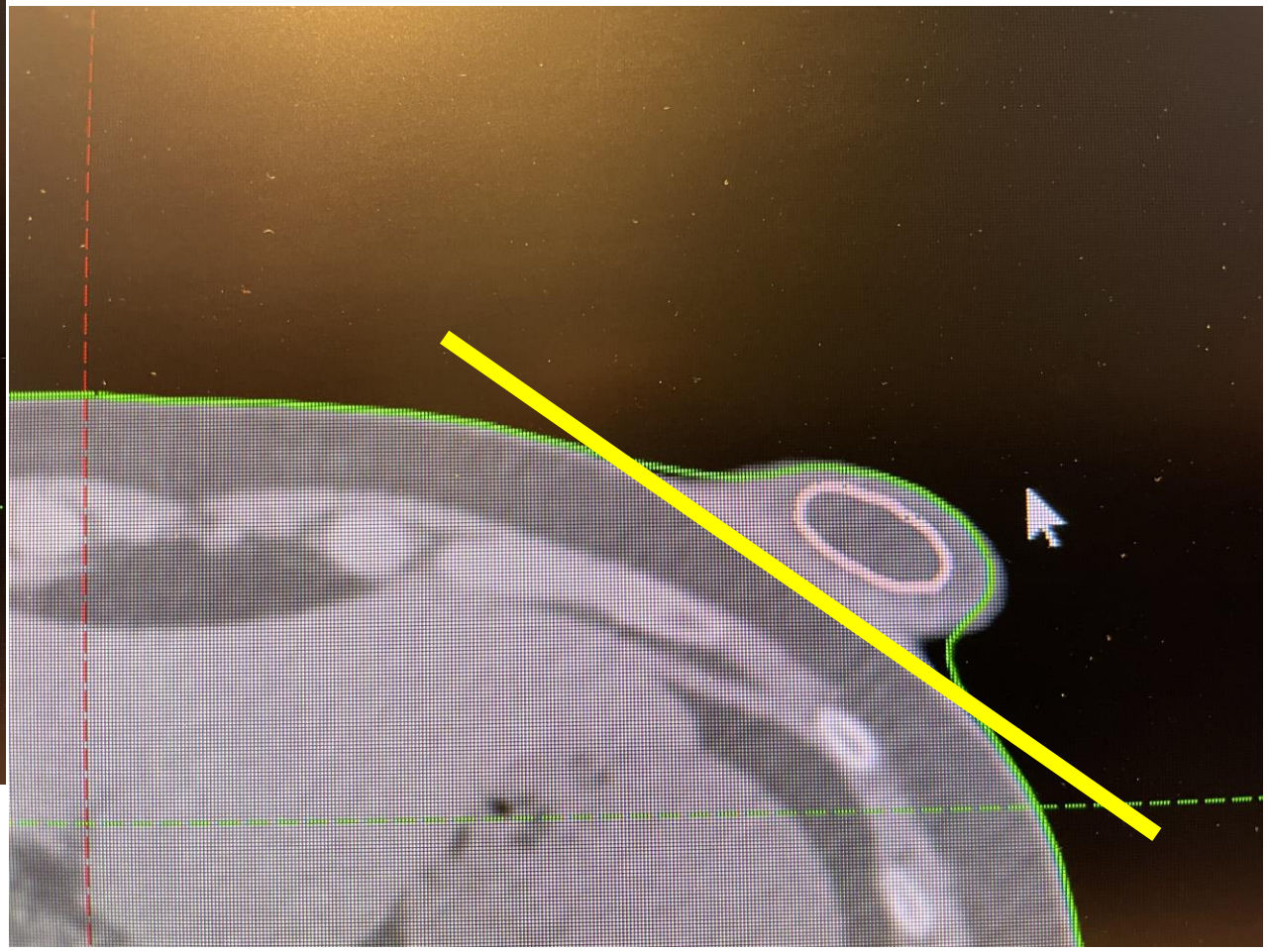


Slide courtesy Orit Kaidar-Person.

AI in BC – ToolBox-3: *Critical notes*

Expert contouring





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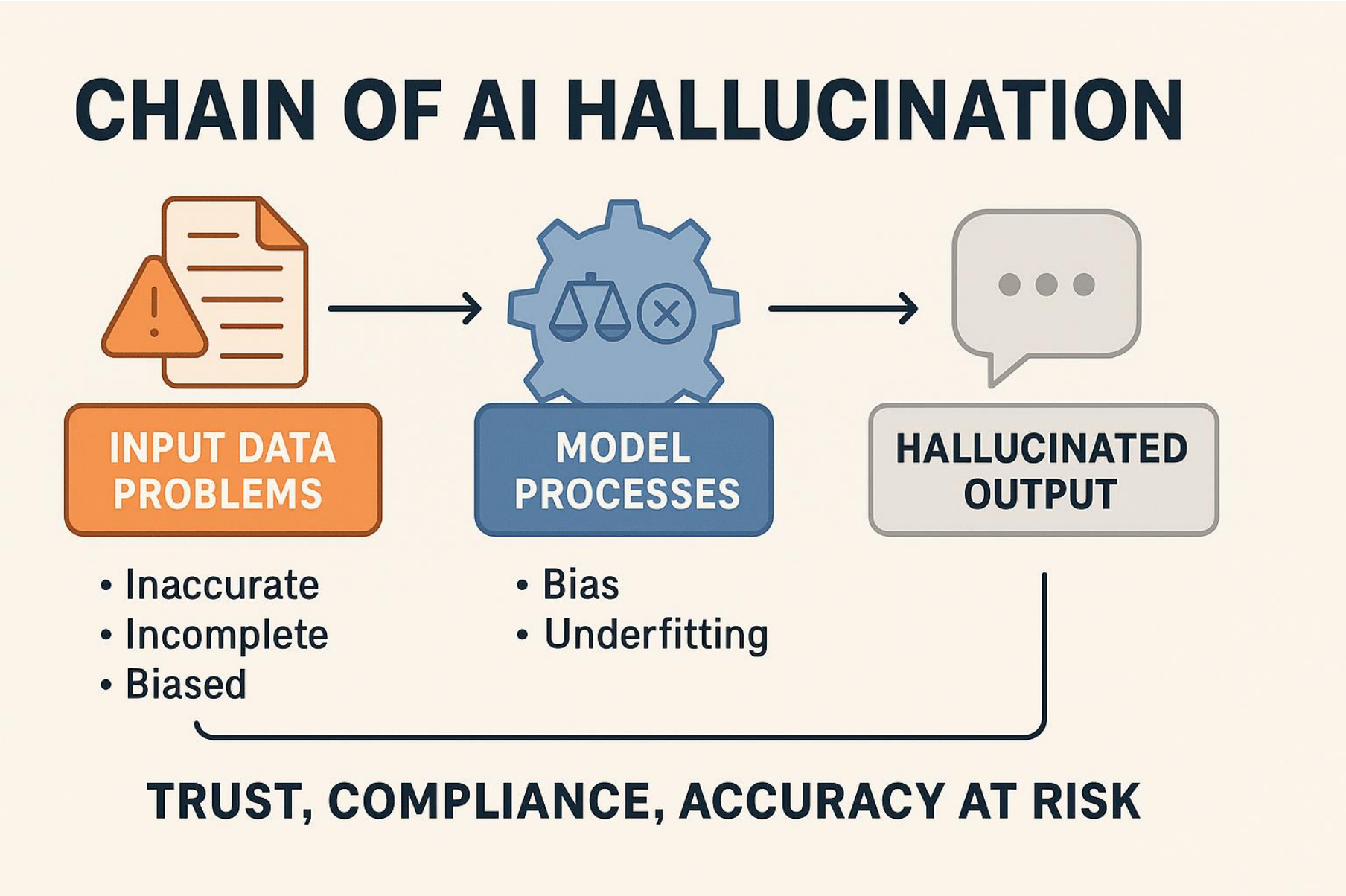

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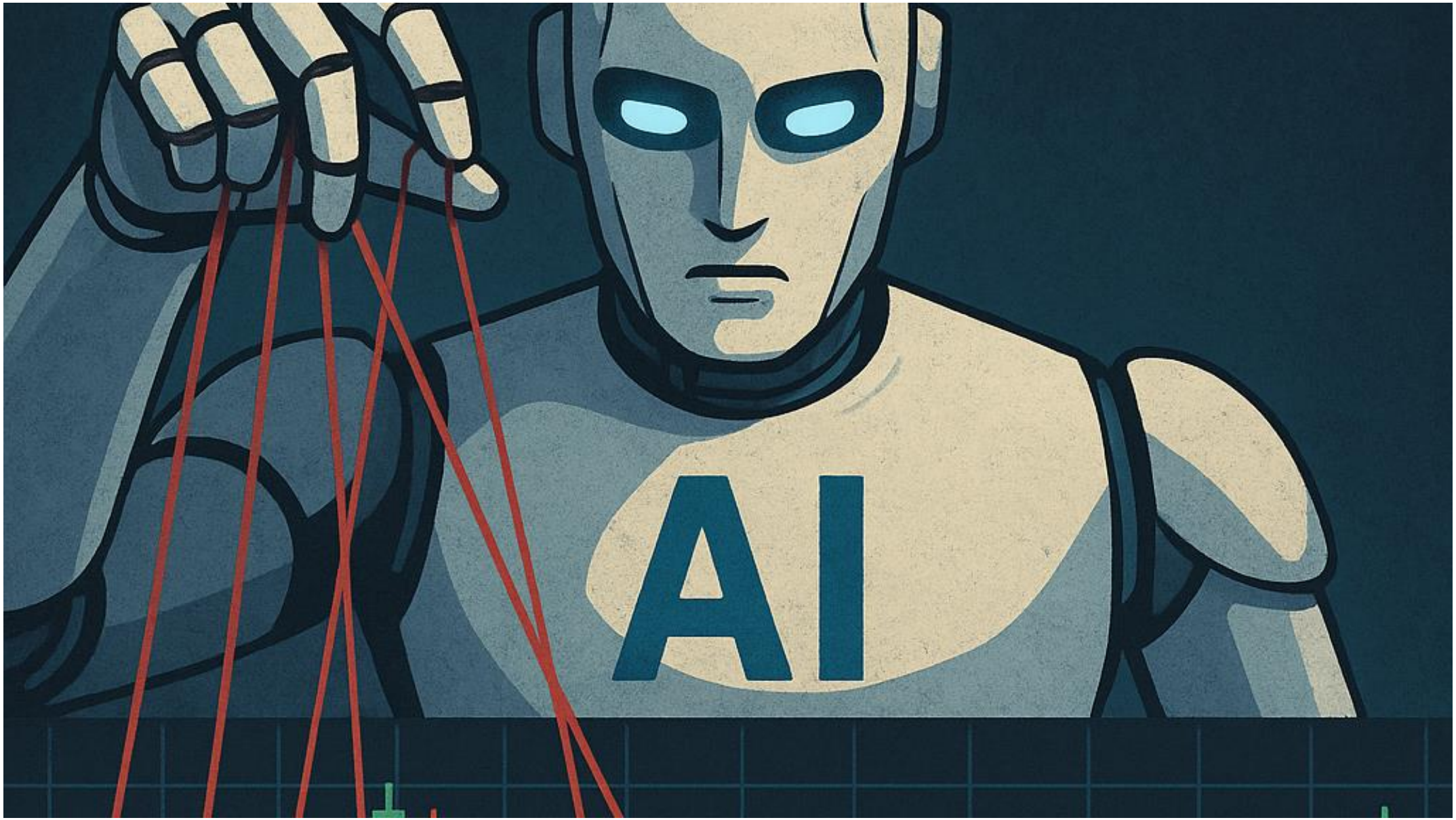
AI in BC – ToolBox-3: *Critical notes*



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AI in BC – ToolBox-3: *Critical notes*

https://share.google/images/bfNltEfpRPnnIszDY

THE ETHICS OF AI IN RADIOTHERAPY

HOW SHOULD WE USE THE AUTOPILOT MODE?

Monica-Emilia Chirilă

Slide courtesy Monica Chirila

Conclusions

AWARENESS

INFORMATION

ETHICS

DECISION

Slide courtesy Monica Chirila

Conclusions

A well-balanced approach can bring together the **precision, consistency, and performance** of the AI with human abilities like **integration, adaptation, and creativity**, to improve patient care and outcomes.

Slide courtesy Monica Chirila

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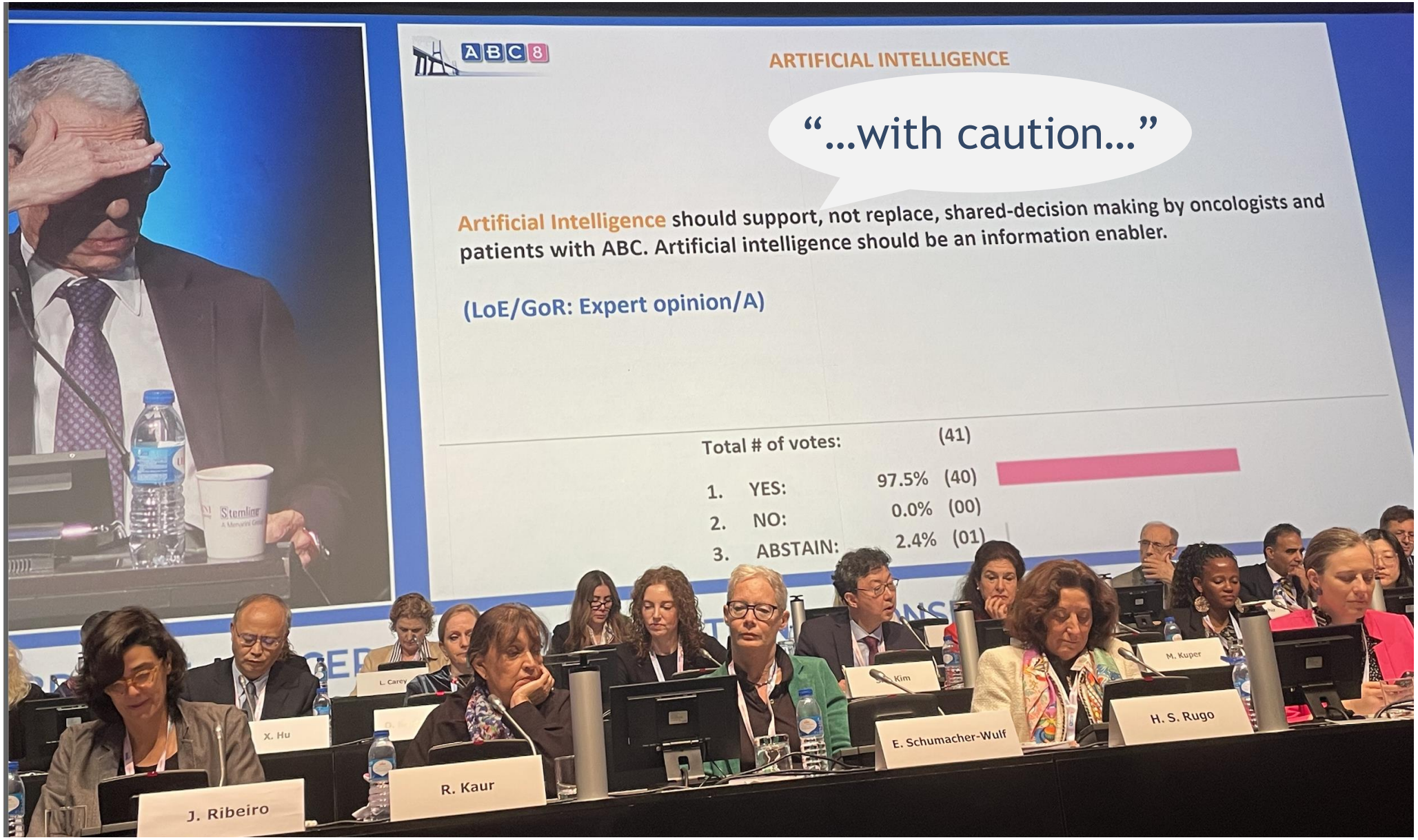
AI in BC – ToolBox-3: *Conclusion*



2025-11-08, Lisbon, ABC-8 panel voting

Conclusion

Brustzentrum Heidelberg
Klinik St. Elisabeth

Toolbox 3 has provided

- **comprehensive research agenda** to address the most pressing **knowledge gaps in digital breast cancer care**
- collaboration across disciplines and aligning research priorities with **clinical and patient needs**
- potential to
  - **enhance patient outcomes**
  - **improve the efficiency** of care delivery
  - set new standards for **integration of digital health technologies in oncology**

Will AI replace doctors? NO

Will doctors trained in using AI be better in the future?

YES

AI in BC – ToolBox-3: *Introduction*

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Review

Embargo until publication on 24-11-2025

cancer—a multidisciplinary consensus

André Pfob; Katja Pinker, Ines Vaz-Luis, Antonio Di Meglio, Maria João Cardoso, Giuseppe Curigliano, Oreste Davide Gentilini, Günther Gruber, Nik Hauser, Jörg Heil; Orit Kaidar-Person, Michael Knauer, Han-Byoel Lee, Sae Byul Lee, Sherene Loi, Meinrad Mannhart, Stella Mastora, Icro Meattini, Rosa Di Micco, Aurelia Noske, Fedro Alessandro Peccatori, Fiorita Poulakaki, Mattea Reinisch, Isabel T Rubio, Charlie Swanton, Christoph Tausch, Marie-Jeanne Vrancken Peeters, Jong Han Yu, Walter Paul Weber, Norman Zerbe, Philip Poortmans, Carsten Denkert, Ritse Mann, Suzette Delaloge, Peter Dubsky, for the Toolbox 3 Consortium

Bouganim N, et al. Breast Cancer Res Treat 2013;139:603–6.

Thank you

Toolbox Consortium!

Brustzentrum Heidelberg
Klinik St. Elisabeth

Thank you

Hirslanden Klinik for funding Toolbox 3

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Thank you

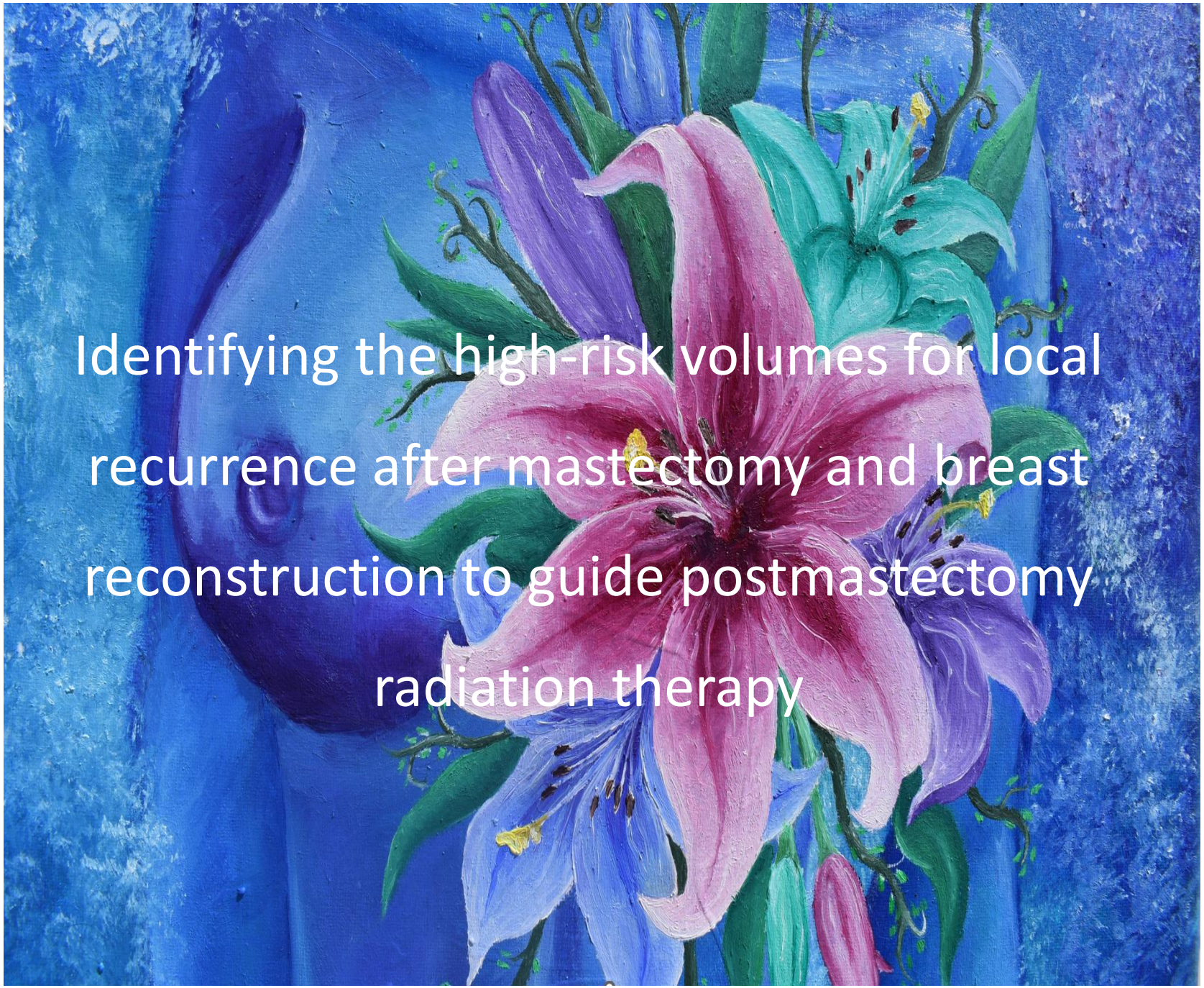
Toolbox Consortium!

Brustzentrum Heidelberg
Klinik St. Elisabeth

Thank you

Hirslanden Klinik for funding Toolbox 3

Archeological discovery in Switzerland



Thank you!

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- Sandra Hol
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- MJ Cardoso
- Kuehn Thorsten
- Lynda Wyld

Orit Kaidar-Person · Icro Meattini · Philip Poortmans *Editors*

Breast Cancer Radiation Therapy

A Practical Guide for Technical Applications

The book provides, in a comprehensive yet concise way, essential information to improve the knowledge and skills of all healthcare providers involved in the treatment of patients with breast cancer. The content does not focus on general information that is widely available via different sources, but on technical aspects – "hands-on" daily practices and principles of radiation oncology that are not included in other books. Drawing on information taught in courses at e.g. the ESTRO School, as well as the authors' broad clinical experience, the respective contributions reflect and share the expertise of leading experts in breast cancer radiation therapy, supported by sound data and evidence. Each chapter includes a short introduction summarizing the evidence in the literature and "pearls" (a short bullet-point summary), and is enriched by tables, figures and illustrations to provide a concise, easy-to-follow and appealing overview.

The book, containing also useful electronic supplementary material, will be of interest to a wide range of readers, including radiation oncologists, radiation technicians, medical physicists, and others involved in breast cancer care.

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Breast Cancer Radiation Therapy

Breast Cancer Radiation Therapy

A Practical Guide for Technical Applications

Orit Kaidar-Person
Icro Meattini
Philip Poortmans
Editors

Springer