



Omics and AI what patient perceives?

Dr Loredana Dinapoli Psychologist Psychotherapist



perception

The APA dictionary of psychology defines perception as “becoming **aware** of objects, relationships, and events by **means** of the senses”. Through this process, the organization and interpretation of sensory information can occur (2013).

LAWS OF PERCEPTION

Poignancy

Good shape

Overlapping

Common destiny



Area

Similarity

Good continuation

Closure

Every object cannot be understood except in relation to the **context** in which it is included



We can only see what we process after we perceive it and endow it with **meaning**

Cancer...

What do patients perceive?



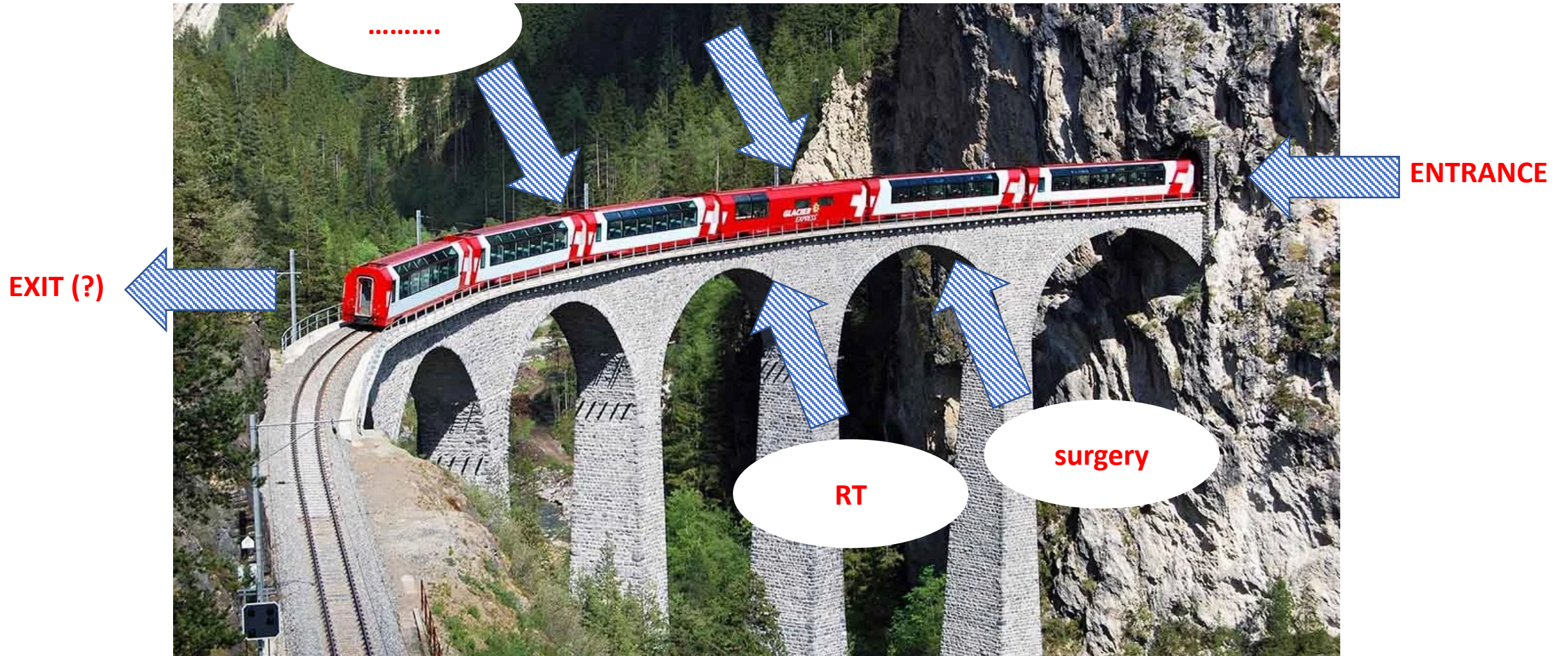
Simone T, 2012

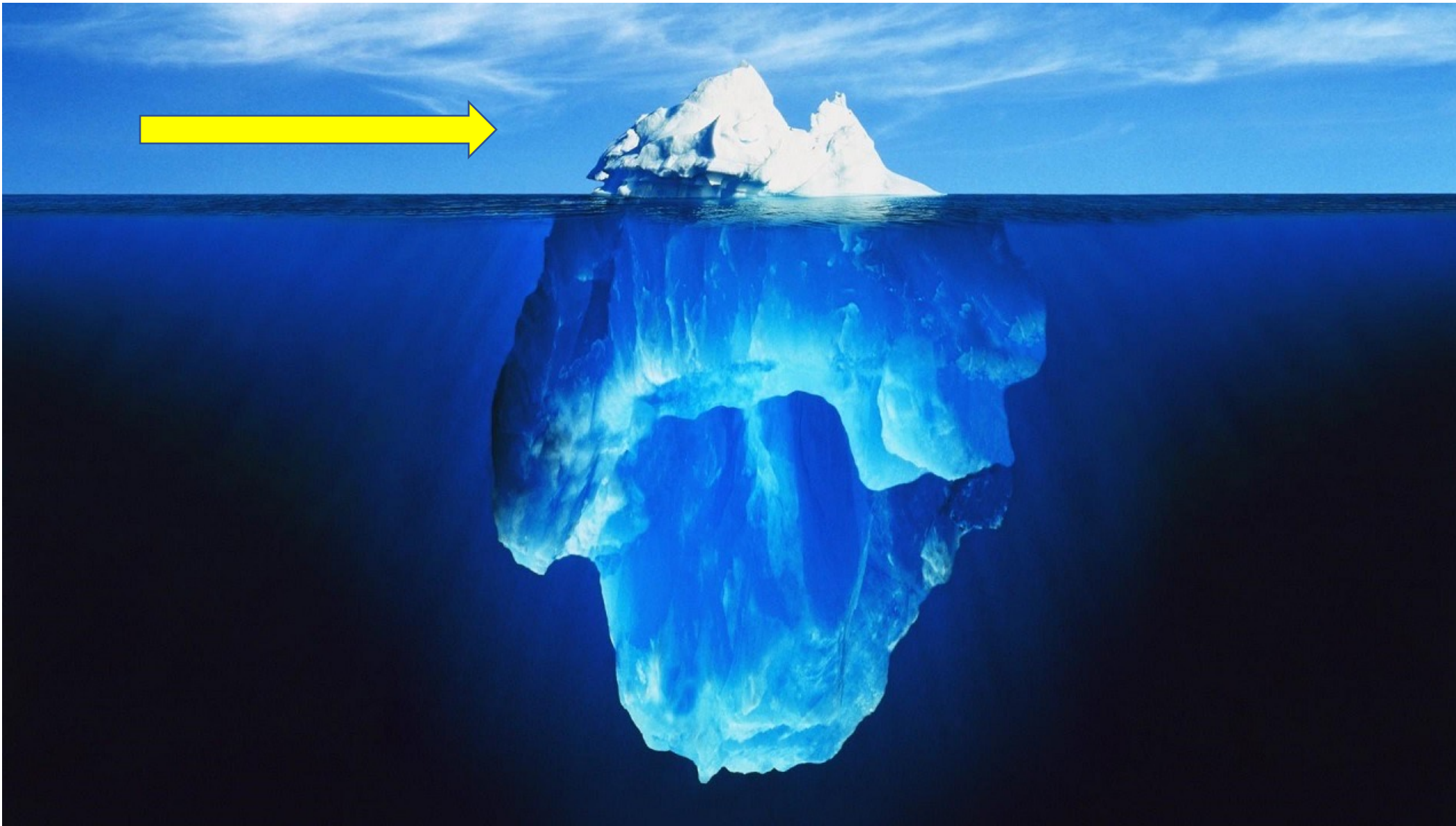
THE MEANING OF BEING CANCER PATIENTS

Patients' point of view

The cancer train

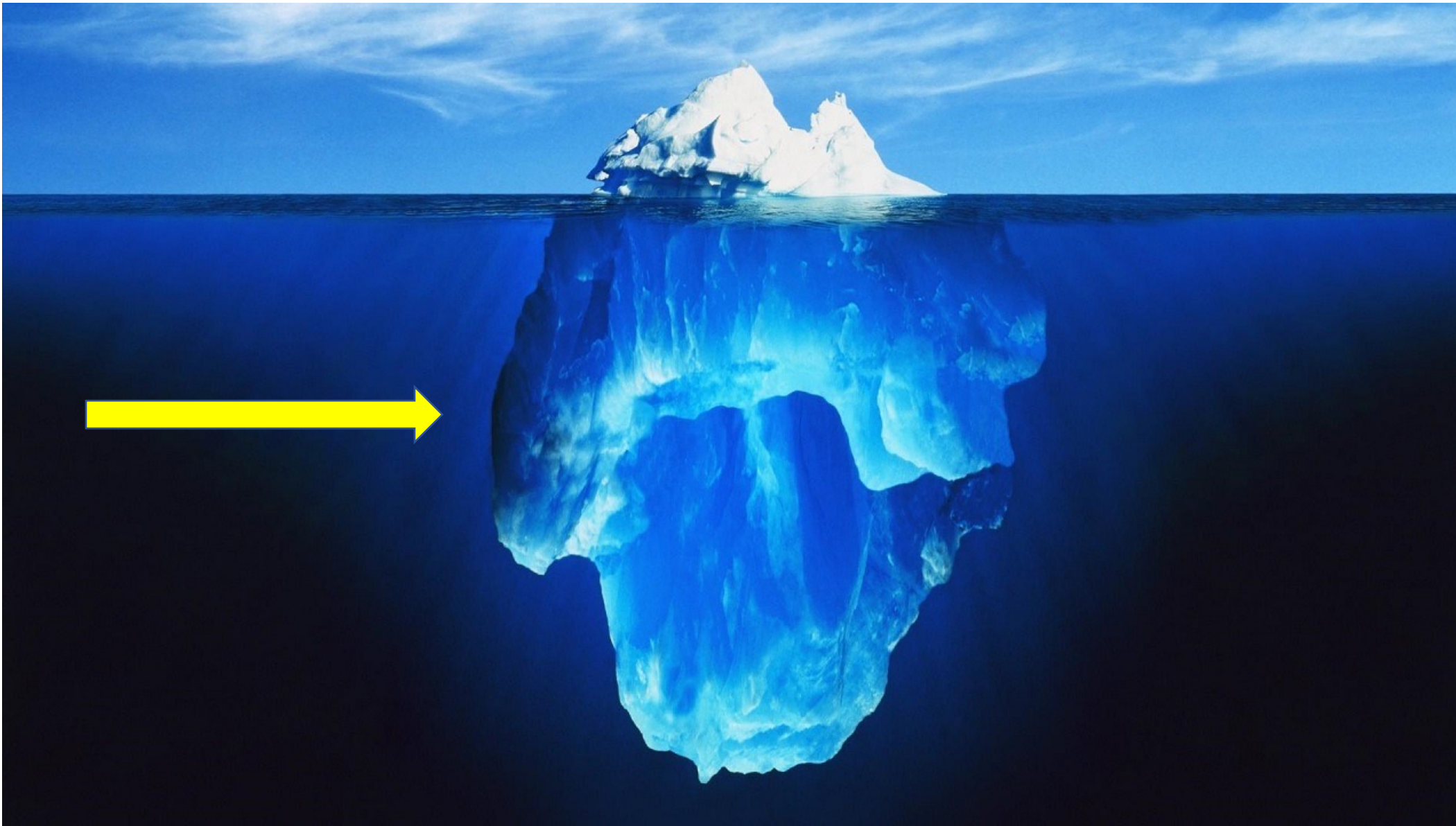
CT

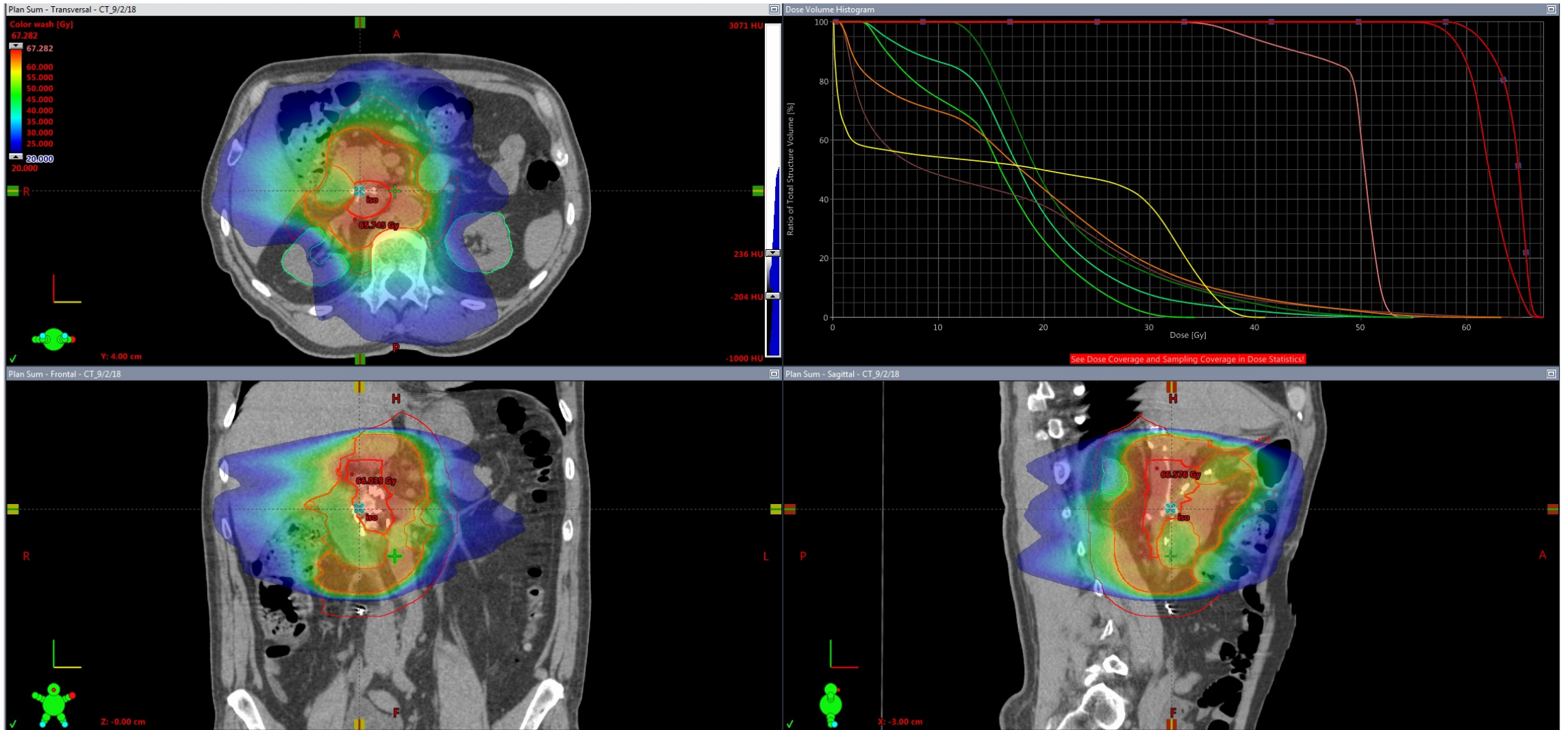




THE MEANING OF BEING CANCER PATIENTS

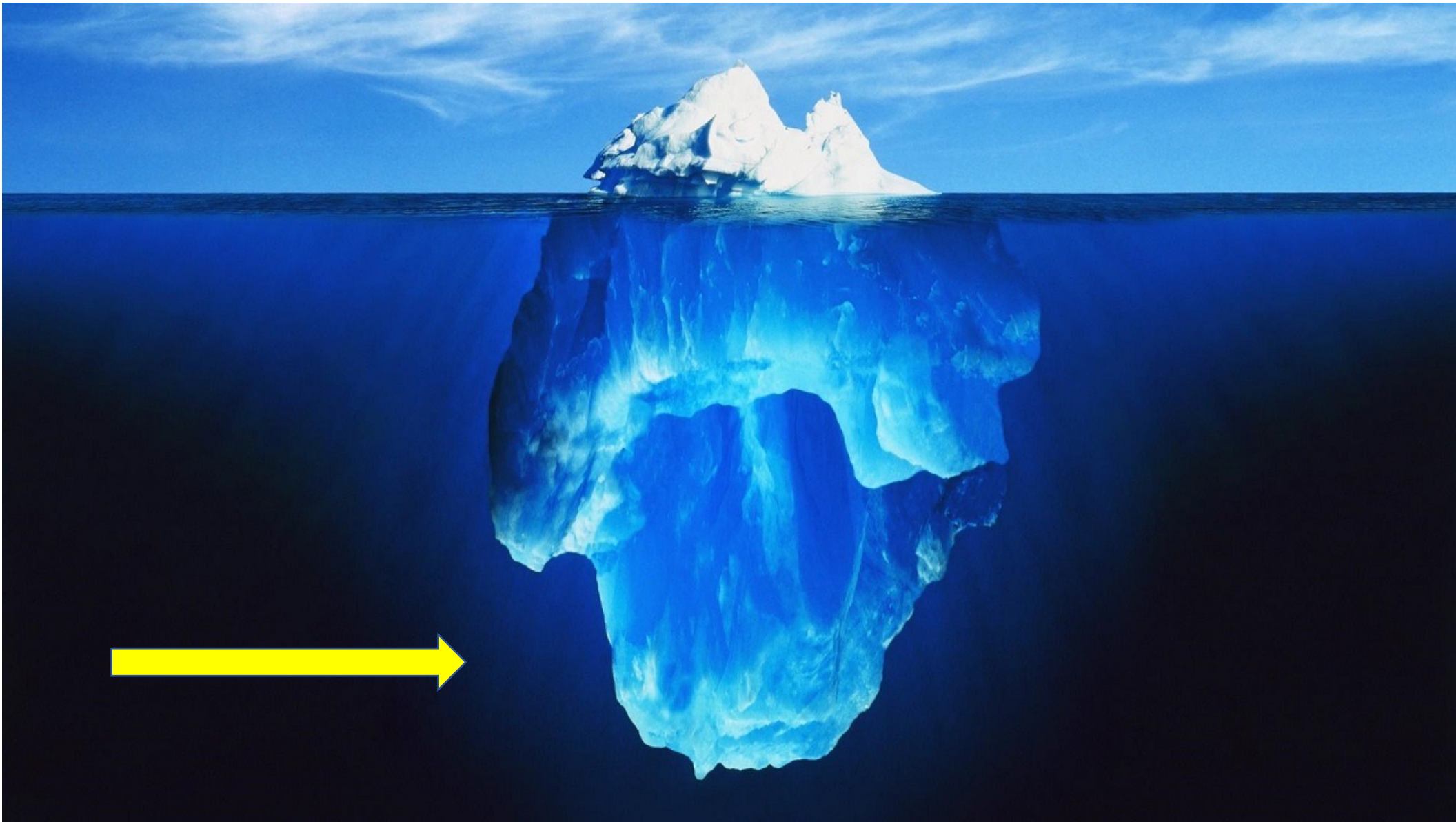
Radiation Oncologists' point of view





THE MEANING OF BEING CANCER PATIENTS

Psychologists' point of view



- **Major depression (15%), Minor depression (20%), and Anxiety (10%)**
- Two thirds of patients with cancer and depression also have clinically significant anxiety symptoms
- **Major depression** affecting an estimated 13% of patients with **lung cancer**, 11% of those with **gynaecological** cancers, 9% in **breast** cancer, 7% in **colorectal** cancer, and 6% in **genitourinary** cancers.
- The highest levels of **anxiety** are reported in **lung, gynaecological, and haematological** cancers.

PSYCHOLOGICAL REQUIREMENTS DURING RT

Support Care Cancer

Table 2 Frequency of affective disorders, suicide ideation/risk, anxiety disorders, and adjustment disorders, before radiotherapy, at the end of radiotherapy, and at the 1-month follow-up

Psychopathological disorders. Structured interview MINI and DSM-IV-TR	Onset of RT <i>N</i> = 232%	End of RT <i>N</i> = 130%	Follow-up <i>N</i> = 130%	Cochran's <i>Q</i> test significance	Sig. McNemar T1–T2 T1–T3 T2–T3
Affective disorder	7.3	4.6	4.6	<i>p</i> = .33	<i>p</i> = .50 <i>p</i> = .38 <i>p</i> = 1.0
Suicide ideation/risk	13.8	8.5	8.5	<i>p</i> = .39	<i>p</i> = .18 <i>p</i> = .42 <i>p</i> = 1.0
Anxiety disorders	14.2	15.34	17.7	<i>p</i> = .86	<i>p</i> = 1 <i>p</i> = 1 <i>p</i> = .82
Adjustment disorders	10.3	9.2	6.2	<i>p</i> = .47	<i>p</i> = .80 <i>p</i> = .34 <i>p</i> = .55
Grouped disorders (excluding overlapped disorders) ^a	32.3	26.9	26.9	<i>p</i> = .25	<i>p</i> = .27 <i>p</i> = .28 <i>p</i> = 1

T1 onset of radiotherapy, T2 end of radiotherapy, T3 1-month follow-up

^aOverlapped: patients with suicide ideation/risk that suffer from mood, anxiety, or adjustment disorders

Anxiety Depression
 26% while starting
 RT

PERCEIVED BARRIERS TO PSYCHOLOGICAL TREATMENT IN RT

Top 3 barriers for all patients

1. **counseling costs** (58.4%)
2. **daily responsibilities** (43.6%)
3. **physical health symptoms (fatigue/pain)** (37.7%).

How to get around the obstacle?

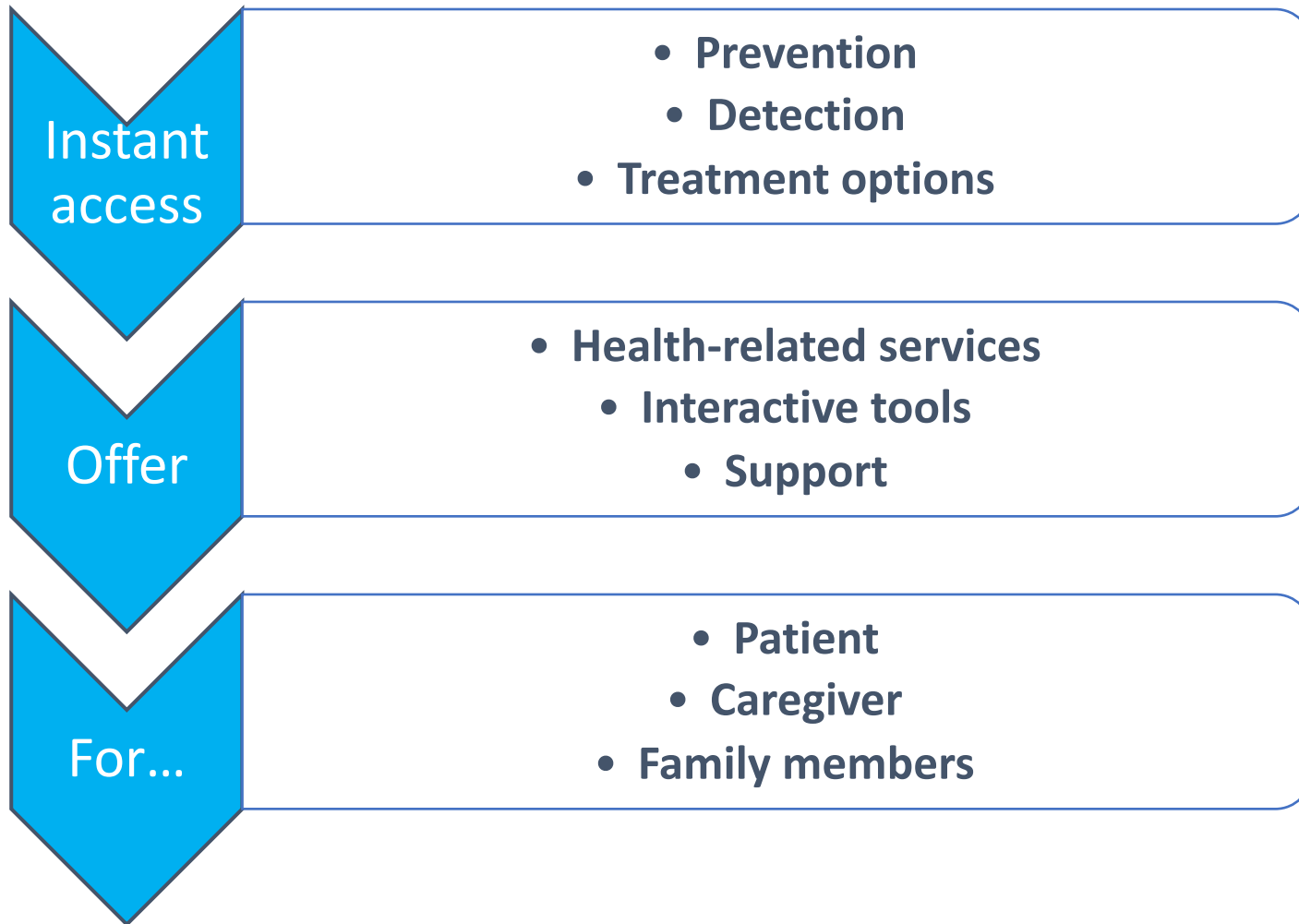
DIGITAL MEDICINE

The use of digital tools to **upgrade the practice** of medicine to one that is **high defined and individualized**

Core=the development of **technological solutions** to **monitor, process and integrate** vast amounts of data at the individual and population levels to help **address the health problems and challenges faced by patients, clinicians and health systems alike**

DEMOCRATIZE ACCESS TO CARE AND EMPOWER PATIENTS TO ENGAGE WITH THEIR HEALTH IN A TRULY PREVENTIVE WAY

HEALTH APPLICATIONS (APPS)



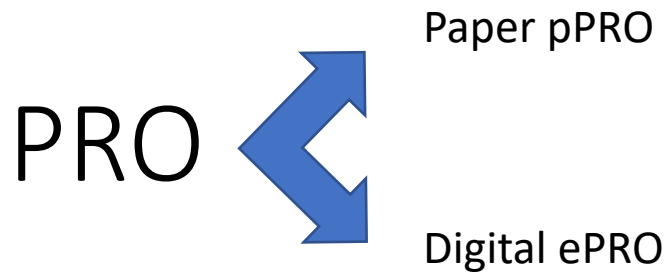
HEALTH APPLICATIONS (APPS)

- ✓ Breast, prostate, skin, melanoma
- ✓ 123 apps (Apple iTunes 40; Google Play 83)
- ✓ Interactive features=ability to monitor symptoms, side effects, treatments, and chronic pain (20%, 25/123).

HEALTH APPLICATIONS (APPS)

- ✓ Positively influence **self-efficacy, empowerment**, and the **selfmanagement** activities of patients
- ✓ Patients **accept** app-assisted cancer treatment and aftercare
- ✓ Patients believe that regularly transmitted data would be an **ideal complement** to standard follow-up procedures

...however



acceptance and evaluation of a tablet-based ePRO app for breast cancer patients and to examine its suitability, effort, and difficulty
 76 (72%) patients in adjuvant therapy and 30 (28%) with metastatic disease

ePRO assessment improves health care in hospitals (87/106, 82.1%)

...however

evaluation of ePROs depended on the level of education ($p=.003$) in the dimensions of effort and difficulty

Figure 2. Effort and difficulty of the electronic patient-reported outcome survey in relation to the paper-based patient-reported outcome (pPRO) survey.

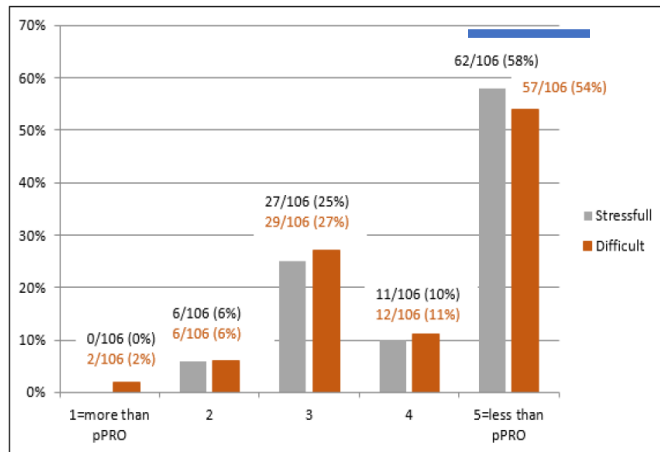
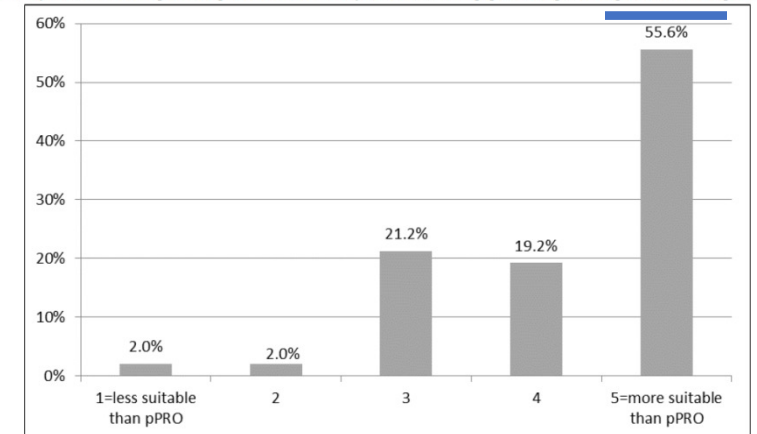
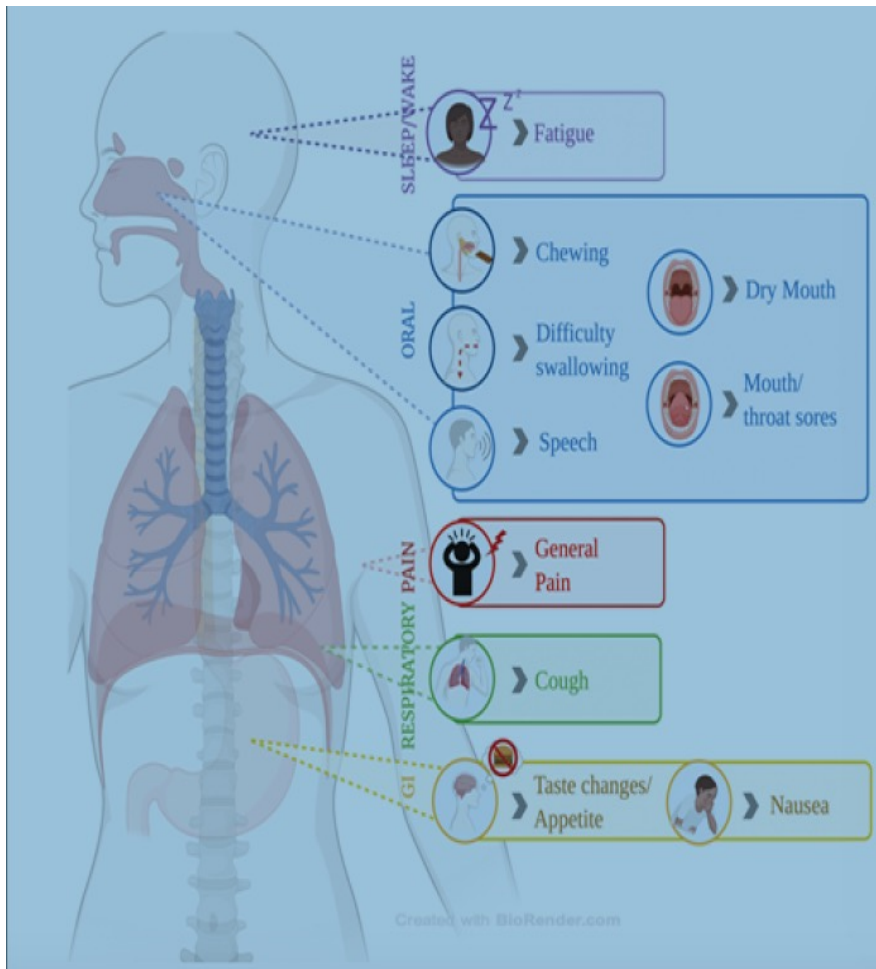


Figure 1. Suitability of the electronic patient-reported outcome survey in relation to the paper-based patient-reported outcome (pPRO) survey.





Biweekly questionnaires (based on the Patient-Reported Outcomes version of the Common Terminology Criteria for Adverse Events) via the app for an 8-week study period.

Endpoints: retention, adherence, and usability

Additional postintervention questions: perceived usefulness, acceptance, and overall satisfaction

375 of 512 (73.2%) questionnaires were completed, with **17 (53%) of the 32 participants adherent**

...however

only IOS developed high drop-out

HEALTH APPLICATIONS (APPS): WHAT PATIENT PERCEIVES...

- Few apps track appointments, medications, treatments, side effects, and chronic pain
 - Limited ability to post photos and share status updates on social media platforms
 - Absence of a glossary of terms as an instrumental resource
 - Scarce content sources
 - Only 3% of the applications (4/123) stated content had been evaluated by health providers
- not meeting patients' needs


1191 pts
 Multicenter RCT

JAMA

QUESTION In patients undergoing treatment for metastatic cancer, does electronic symptom monitoring improve patient-reported outcomes?

CONCLUSION Use of weekly electronic patient-reported outcome (PRO) surveys to monitor symptoms resulted in statistically significant improvements in physical function, symptom control, and health-related quality of life (HRQOL) at 3 months vs usual care among patients with metastatic cancer.

POPULATION




694 Women
496 Men

Adults receiving treatment for metastatic cancer


Mean age: 62 years

LOCATIONS



52 Community oncology practices in the US

INTERVENTION



1197 Patients randomized
1191 Patients analyzed

593

PRO intervention

Weekly electronic patient survey asking about symptoms, performance status, and falls

598

Control

Usual care

OUTCOMES

Secondary outcomes were change from baseline in physical function, symptom control, and HRQOL at 3 months, measured by the EORTC QLQ-C30 instrument. Results on the primary outcome, overall survival, are not yet available.

FINDINGS © AMA

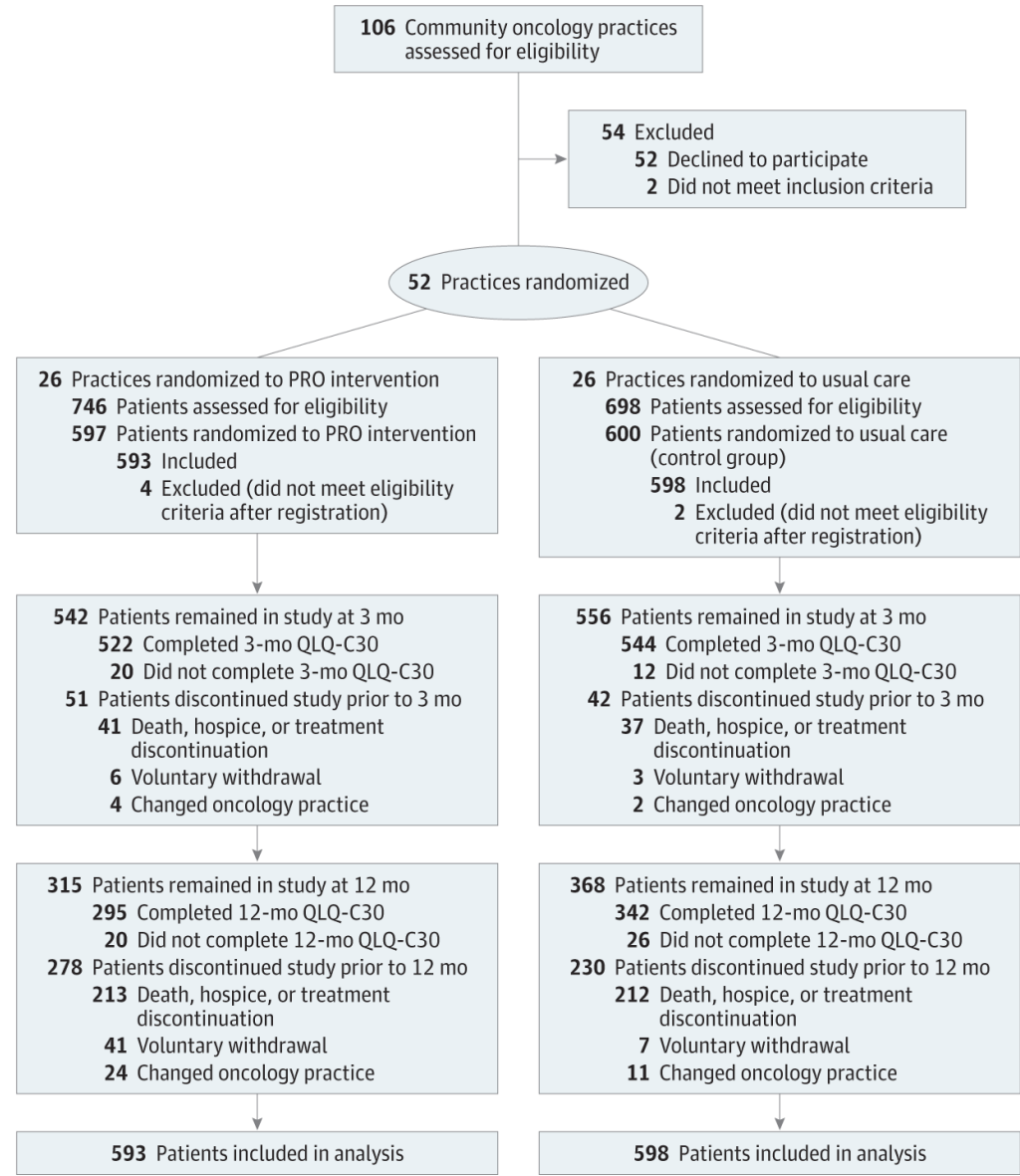
Change in physical function, symptom control, and HRQOL (score range, 0-100 points) from baseline to 3 months

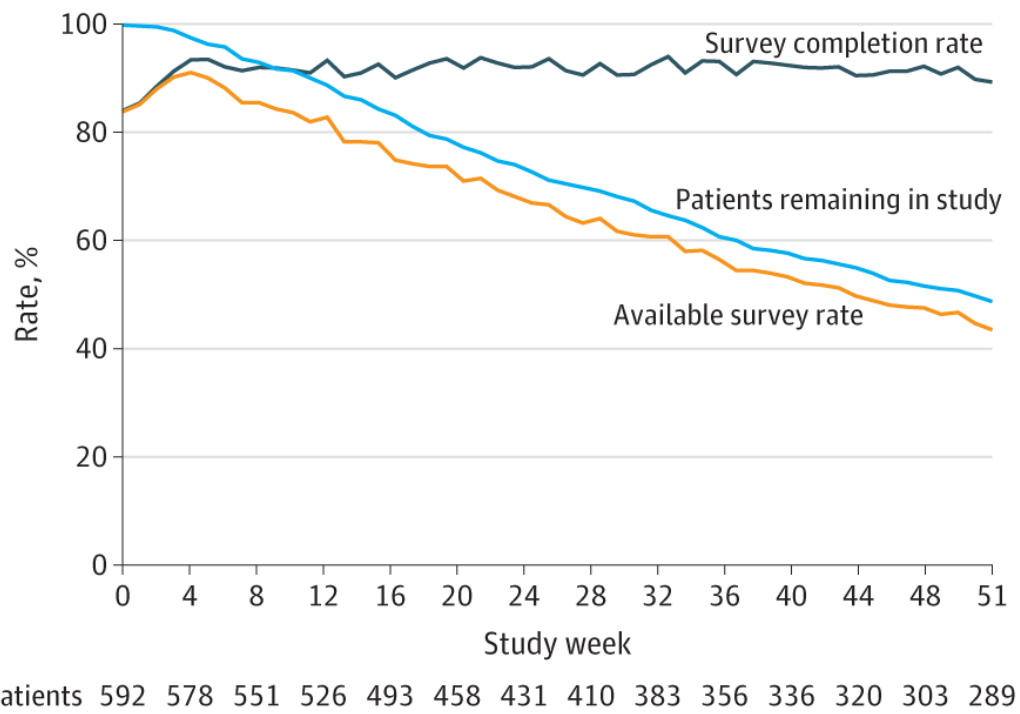
	PRO intervention		Control	
	Baseline	3 mo	Baseline	3 mo
Physical function	74.27	▶ 75.81	73.54	▶ 72.61
Symptom control	77.67	▶ 80.03	76.75	▶ 76.55
HRQOL	78.11	▶ 80.03	77.00	▶ 76.50

Mean differences were significant:
Physical function, 2.47 points (95% CI, 0.41 to 4.53); *P* = .02
Symptom control, 2.56 points (95% CI, 0.95 to 4.17); *P* = .002
HRQOL, 2.43 points (95% CI, 0.90 to 3.96); *P* = .002

Basch E, Schrag D, Henson S, et al. Effect of electronic symptom monitoring on patient-reported outcomes among patients with metastatic cancer: a randomized clinical trial. *JAMA*. Published online June 5, 2022. doi:10.1001/jama.2022.9265

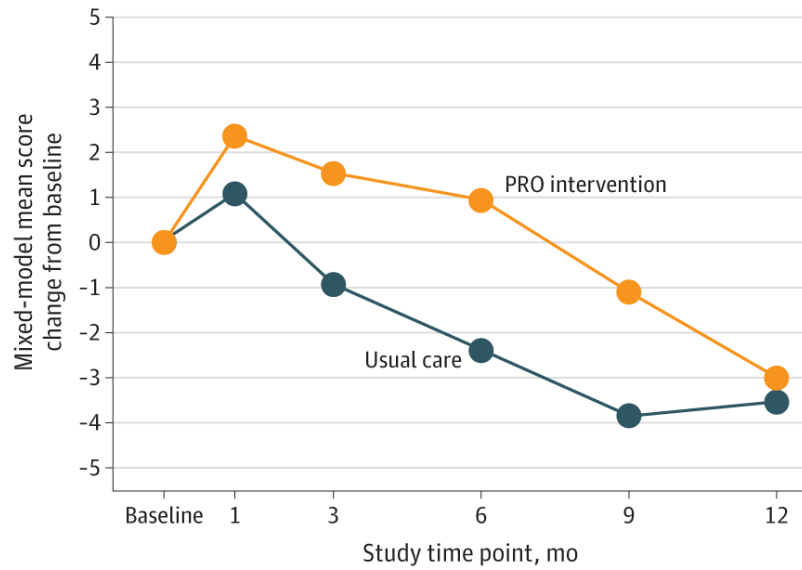
1191 pts
 Multicenter RCT



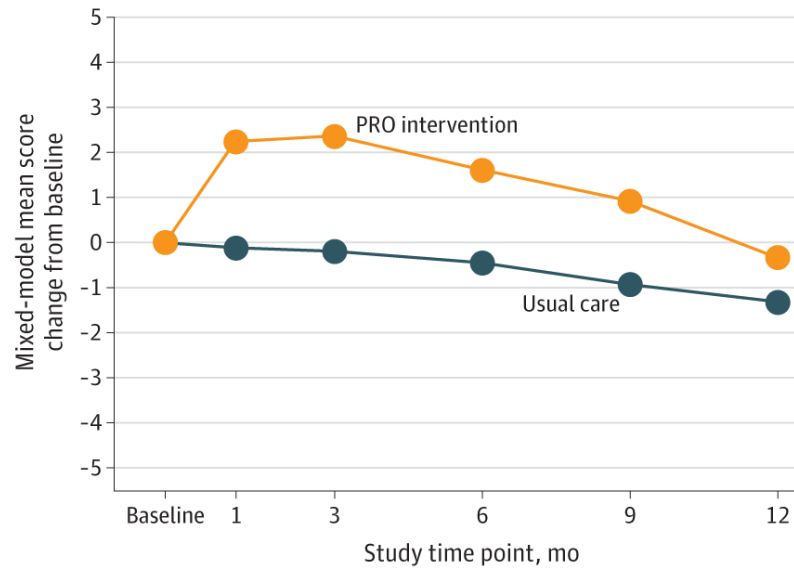


Cancer type		
Colorectal, anal	100 (16.9)	132 (22.1)
Thoracic (lung, thyroid, thymus)	118 (19.9)	110 (18.4)
Breast	97 (16.4)	80 (13.4)
Gynecologic (ovarian, cervix, uterine, vaginal)	64 (10.8)	53 (8.9)
Pancreas, hepatobiliary	48 (8.1)	49 (8.2)
Gastroesophageal, small bowel	25 (4.2)	38 (6.4)
Genitourinary nonprostate (bladder, kidney, testicular, penile)	36 (6.1)	26 (4.3)
Myeloma, lymphoma	31 (5.2)	31 (5.2)
Prostate	33 (5.6)	18 (3.0)
Melanoma, skin	11 (1.9)	21 (3.5)
Other (brain, sarcoma, other soft tissue, head/neck, unknown primary)	30 (5.1)	40 (6.7)

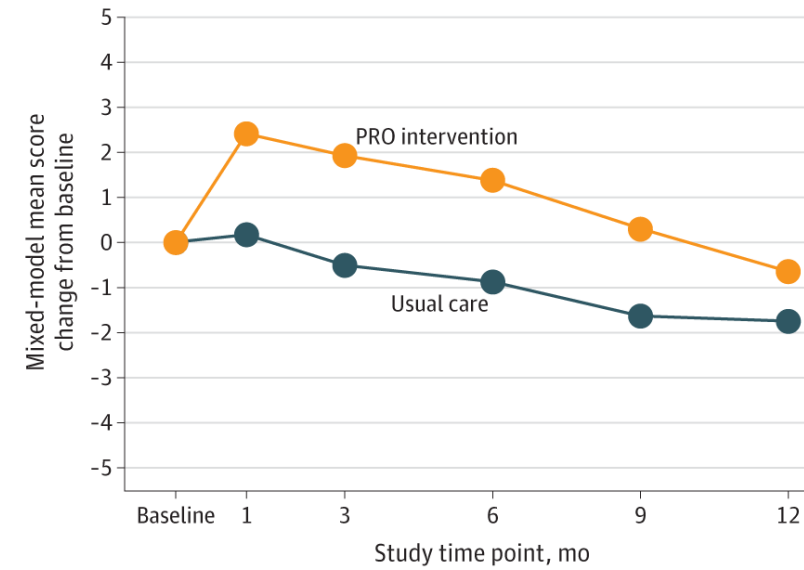
A Mean change in physical function score



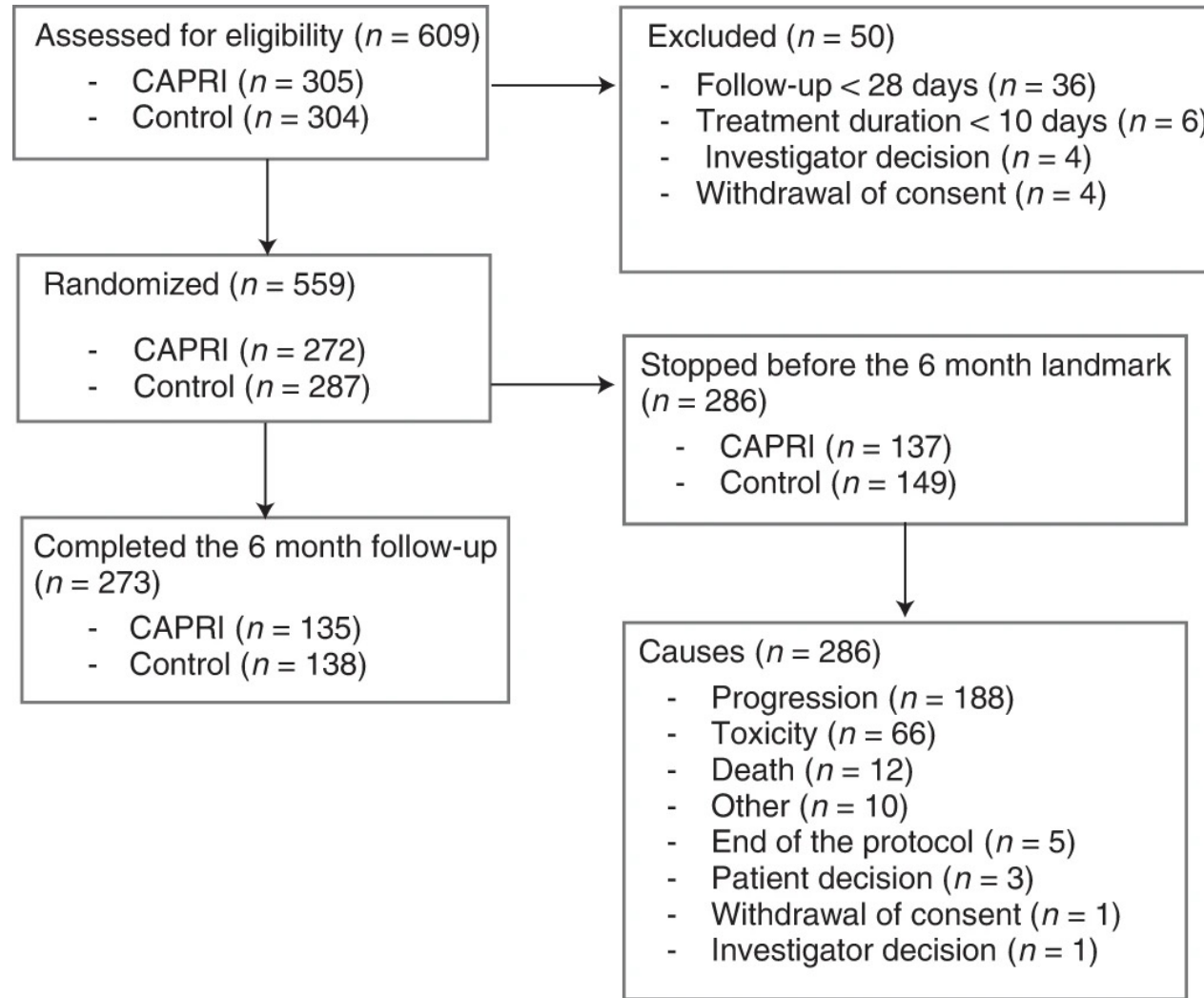
B Mean change in symptom control score

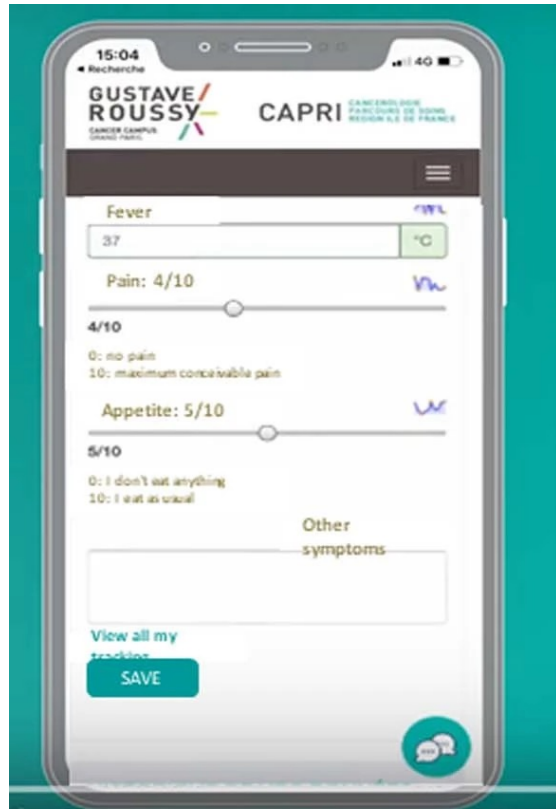


C Mean change in health-related quality-of-life score

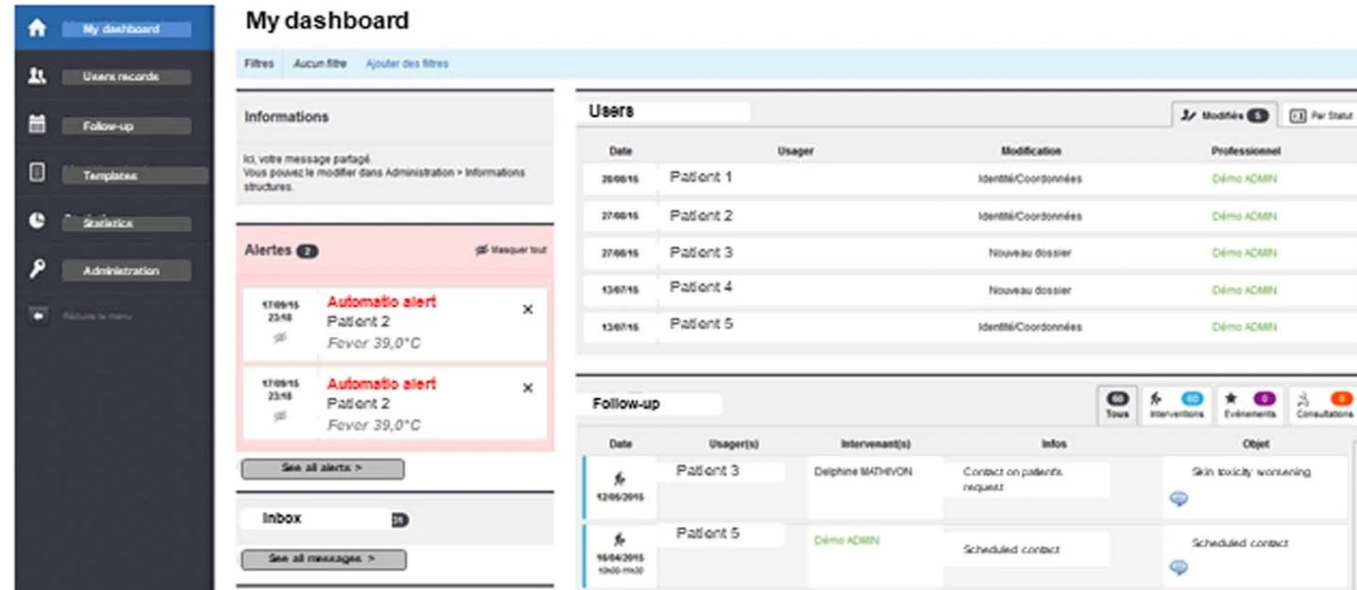


2022 Mir et al.
 273 pts
 RCT





A



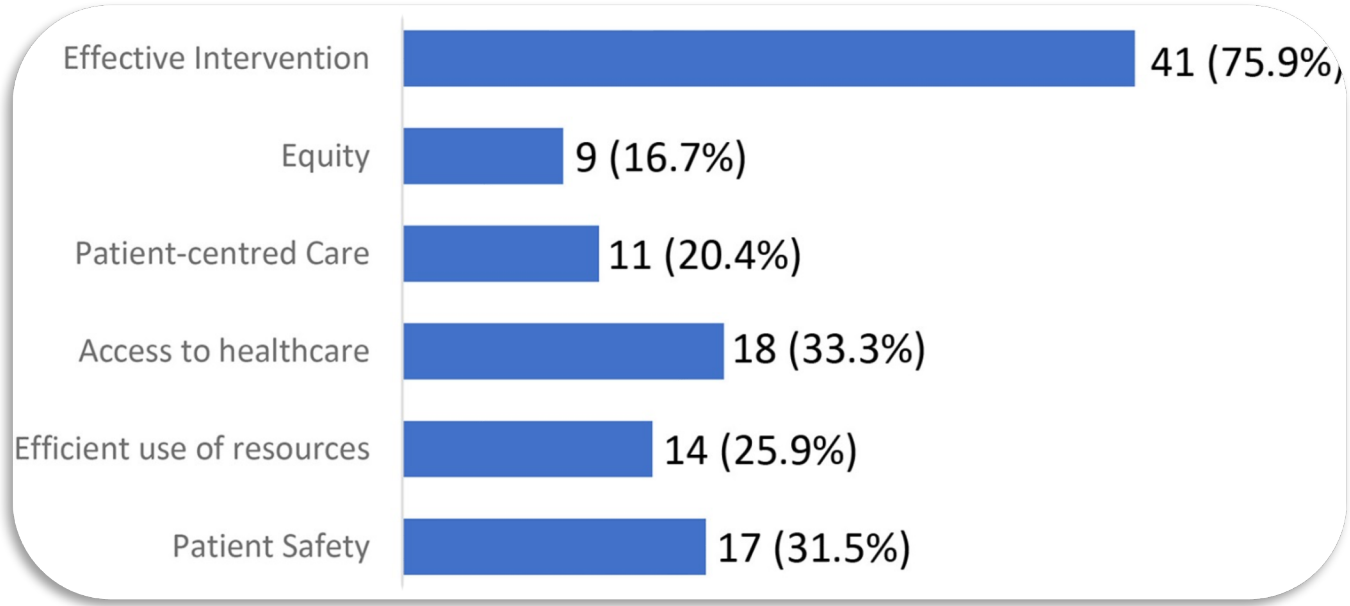
B

Patient perception: PACIC (*Patient Assessment of Chronic Illness Care*)

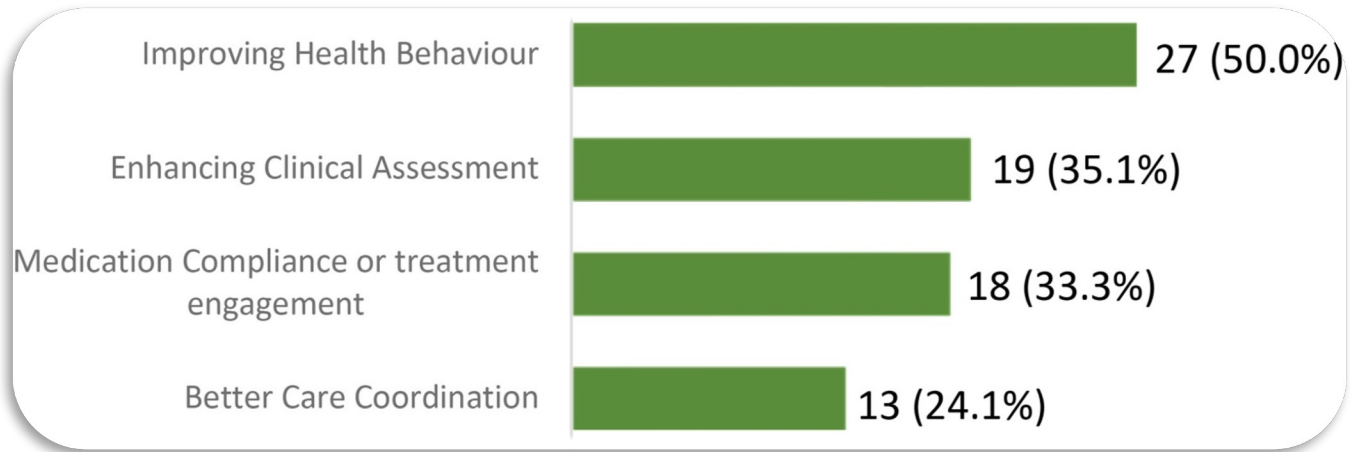
patient activation, delivery system design, goal setting, problem solving, and follow-up/coordination

→	Problem-solving			
	Missing, n (%)	131 (48.16)	144 (50.17)	275 (49.19)
	No. of patients	141	143	284
	Mean (s.d.)	3.19 (1.17)	2.86 (1.29)	3.02 (1.24)
	95% CI	2.99-3.38	2.64-3.07	2.88-3.17
	Min-Max	1.00-5.00	1.00-5.00	1.00-5.00
	Median	3.25	2.75	3.00
	Q1-Q3	2.50-4.00	1.75-4.00	2.00-4.00
				$t = 5$
				$P = 0.03$
→	Coordination			
	Missing, n (%)	125 (45.96)	129 (44.95)	254 (45.44)
	No. of patients	147	158	305
	Mean (s.d.)	2.54 (0.86)	2.02 (0.93)	2.27 (0.94)
	95% CI	2.40-2.68	1.87-2.16	2.17-2.38
	Min-Max	1.00-5.00	1.00-5.00	1.00-5.00
	Median	2.60	1.80	2.20
	Q1-Q3	1.80-3.20	1.40-2.40	1.60-3.00
				$t = 25.96$
				$P < 0.0001$

2022 Ibrahim et al.
 54 reviews
 Review of reviews



Clinical domain



Approaches to improve the effectiveness of health intervention

Machine learning is an application of AI
that trains systems to automatically learn and improve from
experience

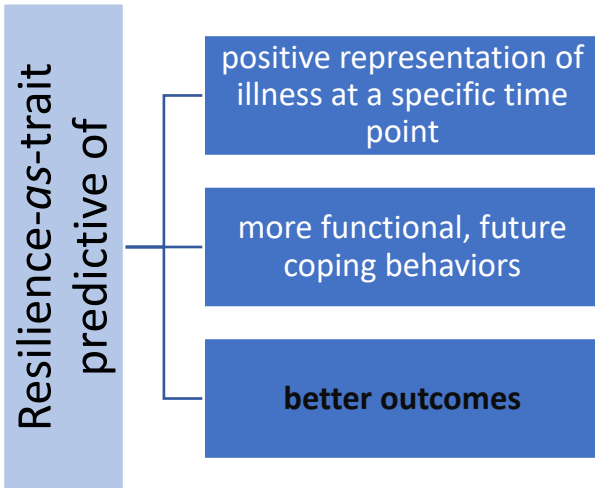
A machine learning-based pipeline for modeling medical, socio-demographic, lifestyle and self-reported psychological traits as predictors of mental health outcomes after breast cancer diagnosis: An initial effort to define resilience effects

Konstantina Kourou^{a,m}, Georgios Manikis^b, Paula Poikonen-Saksela^e, Ketti Mazzocco^{h,k}, Ruth Pat-Horenczyk^l, Berta Sousa^l, Albino J. Oliveira-Maia^{l,1}, Johanna Mattson^e, Ilan Roziner^g, Greta Pettini^b, Haridimos Kondylakis^b, Kostas Marias^b, Evangelos Karademas^{b,d}, Panagiotis Simos^{b,c}, Dimitrios I. Fotiadis^{a,m,*}

New strategies need to be followed in the era of **personalized oncology** for better understanding and **predicting** the **resilience** of women with **breast cancer** as they come to terms with **stressful** and often **life-threatening** events throughout the **disease continuum**.

Resilience

1. a dynamic process linked to a positive outcome over the disease trajectory
2. a personal characteristic (*trait*) which reflects the overall ability of the person to bounce back.



Psychological characteristics:
 optimism, sense of coherence, resilience, self-efficacy, QoL, ability to cope with trauma, mindfulness, cognitive emotion regulation
 Socio-demographic, lifestyle, medical characteristics

Main outcome variable used for risk stratification:
 depression subscale of the Hospital Anxiety and Depression, **Depression scale**

optimism, per
 with can
 resil
 physi
 cognitive function

Propose psycho-oncological intervention!



Strong predictors of health

Towards identifying cancer patients at risk to miss out on psycho-oncological treatment via machine learning

Moritz Philipp Günther¹ | Johannes Kirchebner² | Jan Ben Schulze¹ |
Roland von Känel¹ | Sebastian Euler¹

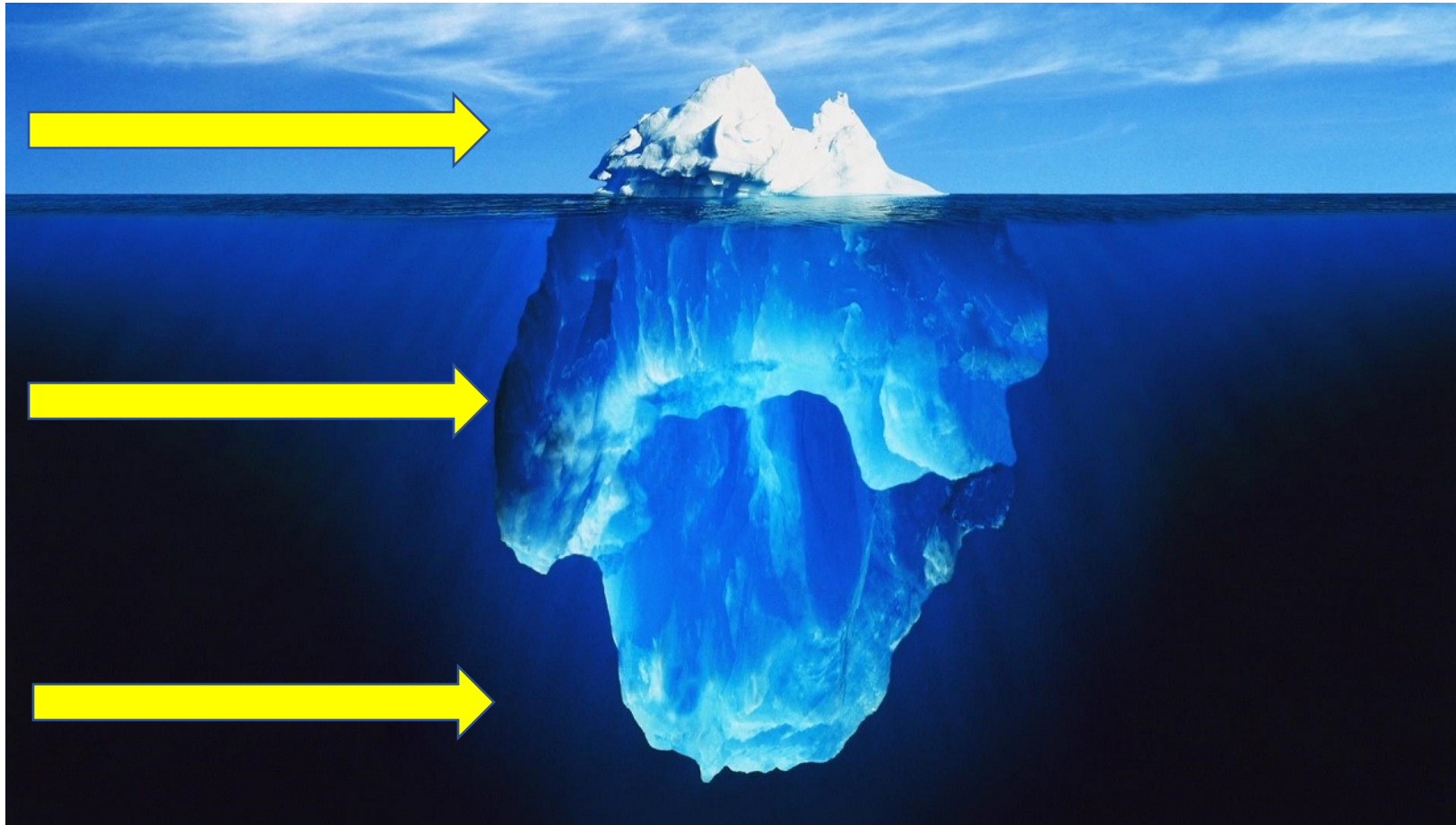
Predicting anxiety in cancer survivors presenting to palliative care – A machine learning approach accounting for comorbidity

Markus W. Haun¹ | Laura Simon² | Halina Sklenarova³ | Verena Zimmermann-Schlegel¹ |
Hans-Christoph Friederich¹ | Mechthild Hartmann¹

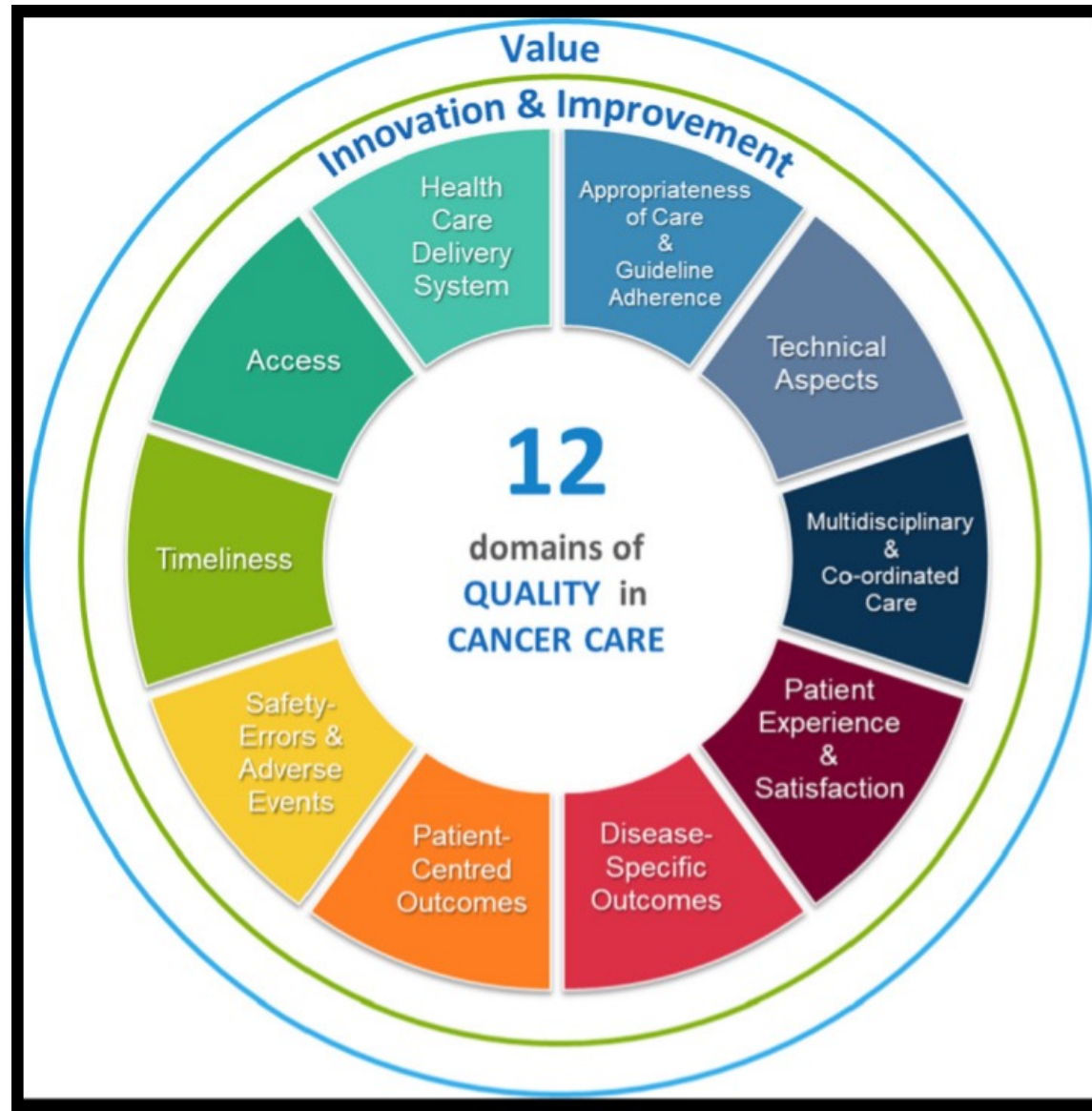
Propose psycho-oncological intervention!

- No formally screened for distress
- Inpatient treatment for less than 28 days
 - No psych diagn
 - Aged ≥ 65
- Not discussed in TB

- Fatigue/weakness
 - Insomnia
 - Pain



**Personalized
(and also
precise!)
Psychological
Interventions**



AI and omics... What do patient, RO, psyD perceive?



the need of human contact and warmth, of being seen, as people at the center of their cancer experience



Simone T, 2012



AI, S. Spielberg 2001

The whole is greater than the sum of its parts

Thank you!

