
Real Time monitoring of patients and AI

Balu Krishna S

About me

In oncology since 2004

Professor of Radiation Oncology CMC Vellore

Started the **QIRAIL** – Quantitative Imaging
Research and Artificial Lab

Since 2020

Focused on AI In radiation Oncology . NLP,
ePROMS, Prehabilitation

Improving Quality of Survival



In the next 20 minutes

Real time Monitoring of patients

Why

How

Future

Real-Time monitoring

In Radiotherapy

NOT TRACKING

NOT SGRT

Knowing how your patient is doing
in between consultations .

Let me tell you 3 stories...

IPSS score...

Data points for AI research

The gratitude paradox

THE IPSS SCORE

Patient Name: _____ Date of Birth: _____ Date completed: _____

In the past month:	Not at All	Less than 2 in 3 Times	Less than Half the Time	About Half the Time	More than Half the Time	Almost Always	Your score
1. Incomplete Emptying How often have you had the sensation of not emptying your bladder?	0	1	2	3	4	5	
2. Frequency How often have you had to urinate (not when you have to go)?	0	1	2	3	4	5	

International Prostate Symptom Score (I-PSS)

Patient Name: _____ Date of birth: _____ Date completed: _____

In the past month:	Not at All	Less than 1 in 5 Times	Less than Half the Time	About Half the Time	More than Half the Time	Almost Always	Your score
1. Incomplete Emptying How often have you had the sensation of not emptying your bladder?	0	1	2	3	4	5	
2. Frequency How many times did you actually get up at night to urinate?	0	1	2	3	4	5	
Total I-PSS Score							

Score: 1-7: Mild 8-19: Moderate 20-35: Severe

The AI LAB

QIRAIL

Quantitative Imaging Research &
Artificial Intelligence Lab

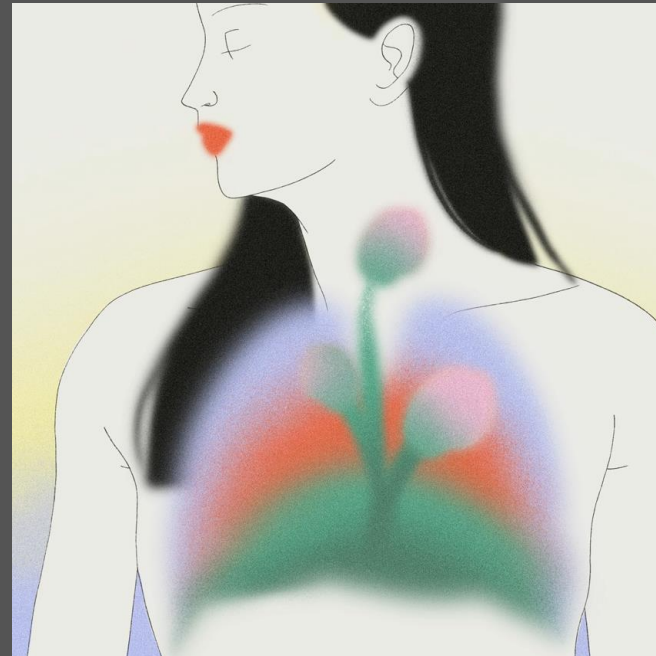
QIRAIL

Radiation Oncology, CMC Vellore

Since 2020 ...

Prognostic AI Models in health care

- Outcome modeling requires robust outcome data
- When we started follow up was abysmally poor- less than 60%
- Needed a mechanism to improve compliance
- Improve access to care
- Improve continuum of care



The Gratitude Paradox

Cancer and its repercussions

- Cancer care - Tedious multidisciplinary long-drawn-out effort
- Fatigue is real!

Patient
Fatigue

Physician
Fatigue

Caregiver
Fatigue



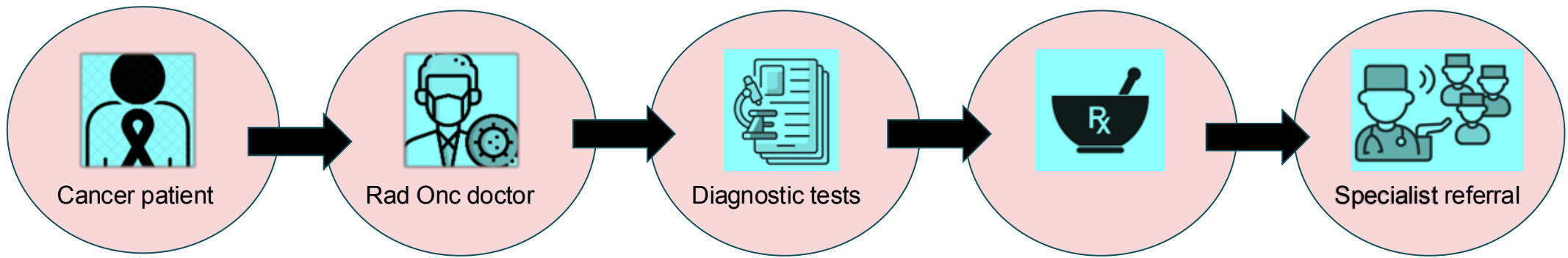
We save lives

Simultaneously create a set
of discontented survivors!

The more we succeed ...
more this problem increases!

THE PROBLEM
WITH
RADIATION
ONCOLOGY

Problems with conventional oncology monitoring



Lack of adherence to care



HIGH COST



LONG WAITING
TIMES



TRAVEL AND
LOGISTICS ISSUE

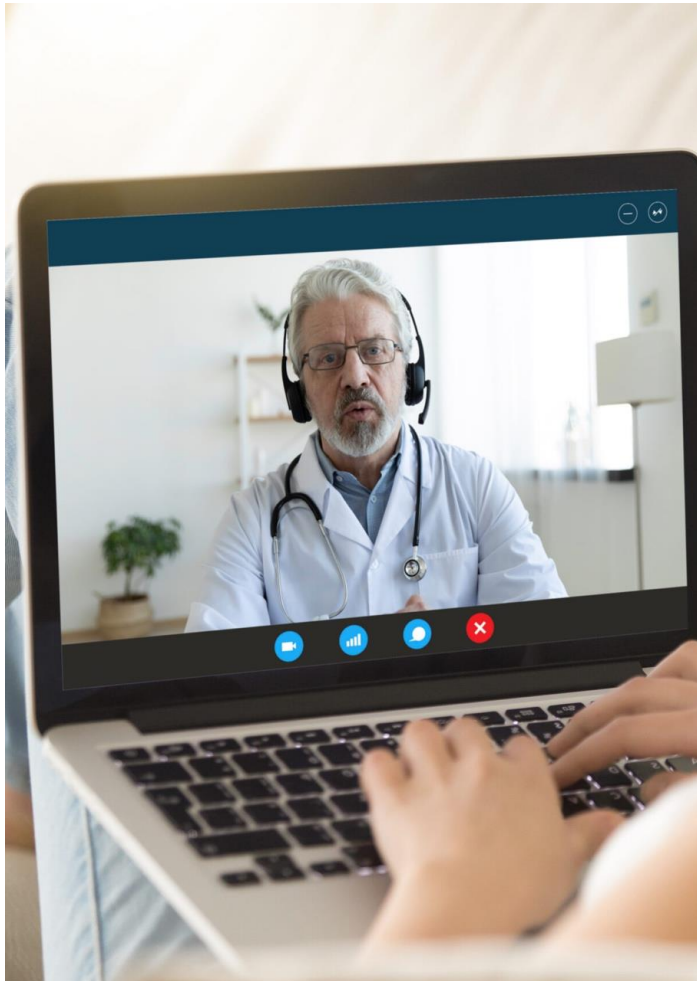


DELAY IN
APPOINTMENTS
WITH
SPECIALISTS



NAVIGATION
THROUGH THE
SYSTEM
CHALLENGING

Solution: Telemedicine



For me: Able to monitor the survival and hope patient is recovering/coping

For Patient: Relief and reassurance that doctor cares

Pros:

Financial burden lessened (travel, itinerary, saved work-days of caregiver etc.)

Cons:

Appointment every 3-6 months

Longer duration wears down the participants.

Scope not clearly defined

Need for **adjunct monitoring** still persists

REMOTE
MONITORING
OF PATIENTS -
WHAT IS IT?

Continuous tracking of patient health data and symptoms outside of clinical settings, using digital tools and technologies.

Real-time tracking of patient symptoms and side effects.

Early intervention and timely treatment adjustments.

Improves patient outcomes and reduces hospital visits

Why should we remotely monitor patients in cancer?



Screening

Monitoring

Nutrition

Mental health

Pain

Side effects of CA and Rx

Improving communication at the individual level

Aid in decision-making

Assess aggregate quality over time

Empowers patient to be active participant in managing their health.

How do we address this?



Making patients partner in data collection



Empowering them



Changing conventional norms of “Patient reported outcome measures” (PROM) to Realtime reported PROMs

PROMS MEASURING HEALTH OUTCOMES

Conventional PROMs

1. Long Questionnaire – leading to fatigue
2. Recall bias
3. Redundancy of information capture

Clinical Implementation barriers

1. Mainly research mode
2. Cultural variations not addressed
3. Language barriers

<https://apersu.ca/what-are-proms/>

Adjunct
monitoring ...
via PROMs-
Patient-reported
outcome measures

Solution: Real-time (electronic) PROMs

Real Time Data Collection.

- Activity levels
- Sleep
- Heart rate

Continuous Monitoring

Predict and alert

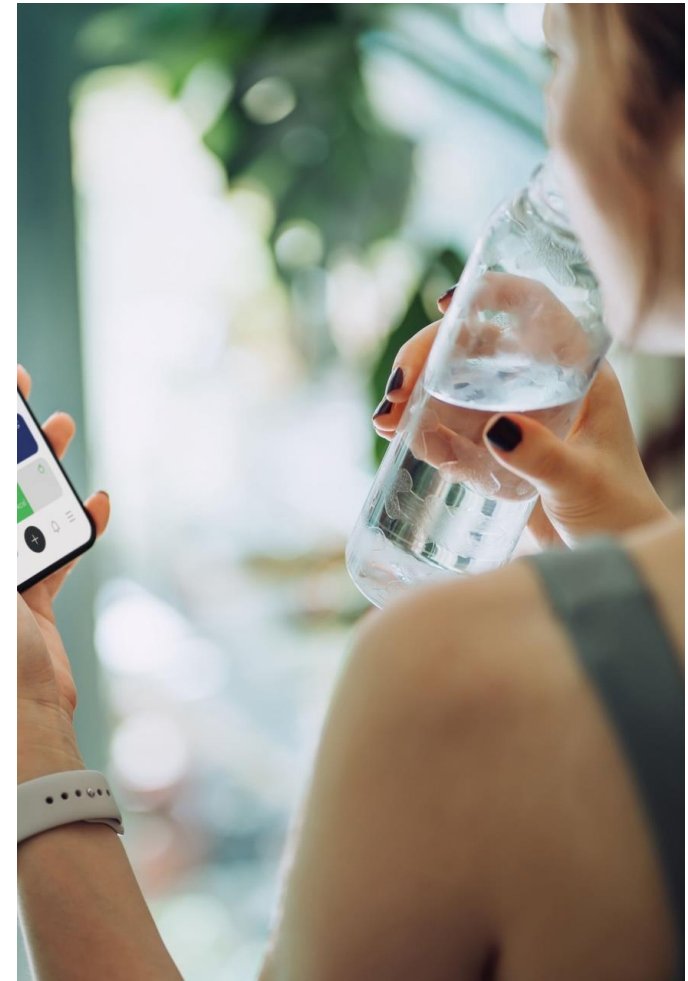
Empower patients

Why not the larger domain of quality of Life ?



Real - time monitoring apps - examples

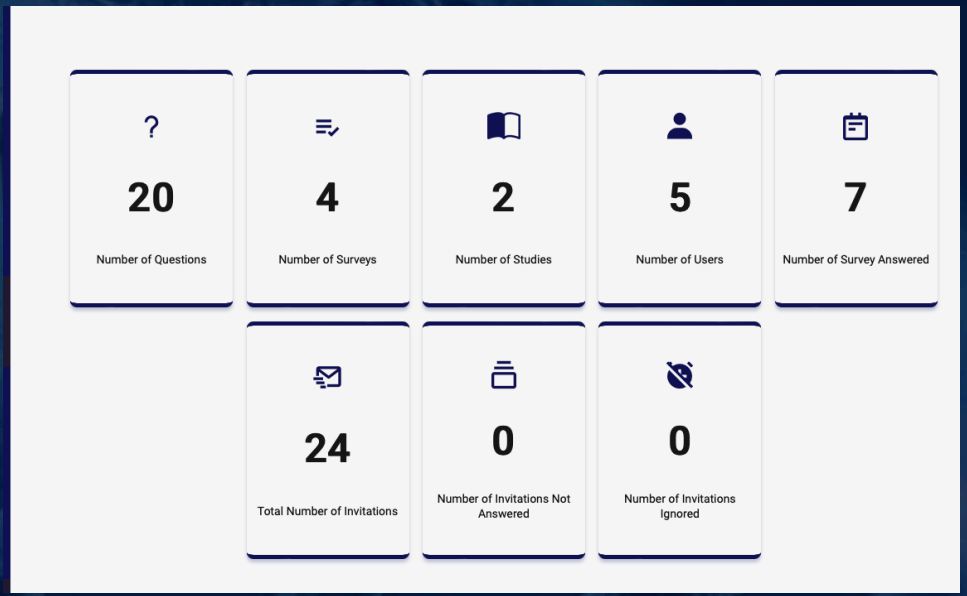
- **Nuna**, mental health companion
- **VARIAN Noona**: Oncology centric patient support
- NHS England Digital - **PROMS**
- **Ada AI Doctor** , personal health companion and telemedicine app
- **Sensely**, a virtual reality nursing assistant . Checks patient, records vitals , funnels them back to physicians.
- **SkinVision**, helps in self-examination of skin condition and informs them when to act.



- ☰ Surveys ▾
- ? Questions ▾
- 👤 Users ▾
- 📄 Reports ▾
- 🕒 History
- ⚙️ Profile

About e-PROM

Patient-Reported Outcome Measures (PROMs) assess the disease symptoms, overall health, and Quality of Life (QoL) from the patient perspective. In our era of wearable and remote monitoring of physical health, I-DAIR envisions assessment methods that would be directly integrated into patient-owned connected devices, with the goal to ease monitoring and avoid interference, such as questionnaire fatigue, recall bias, improper outcome analyses, cultural variations or language barriers.



Our in-house development – Universal ePROM platform Since 2020

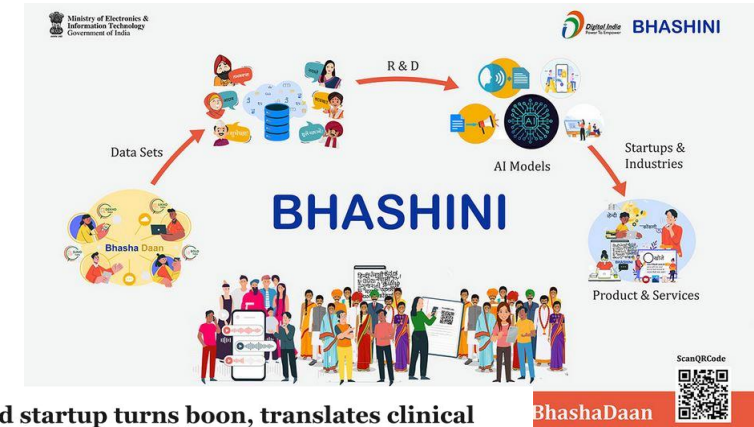
Addressing Language Barriers

- Simplifying medical jargon
- Delivering PROMs in Indian languages
- Informed consent rather than forced assent

Solution

- Natural language processing – Simplify medical text to layman's terms
- Translate to Indian languages (via Bhashini)
- **Pilot in consent forms**
- Benchmark in one disease site – HNC
- **Expand**

Collaboration: IIIT- Hyderabad



IIIT-H incubated startup turns boon, translates clinical trial consent forms

Shirupa Vatyam / TNN / Updated: Jun 6, 2024, 13:32 IST

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New For You



'Our war is your war, our victory will be your victory': Benjamin...



'How far was Oswald...': FBI reveals Trump shooter's shocking Google...



Is lifting of a 44-year-old ban BJP's offer of peace to RSS?



HYDERABAD: A city-based startup has successfully translated patient consent forms and information sheets from English into Telugu, Bangla, Malayalam, Tamil and Hindi to help clinical trial participants make an informed decision.

The solution developed by eBasha Setu, which is incubated at the IIIT-H, is being used by one of the city's major corporate hospitals and a private hospital in Vellore.

What do you see as the biggest challenge in ePROM deployment and remote monitoring?

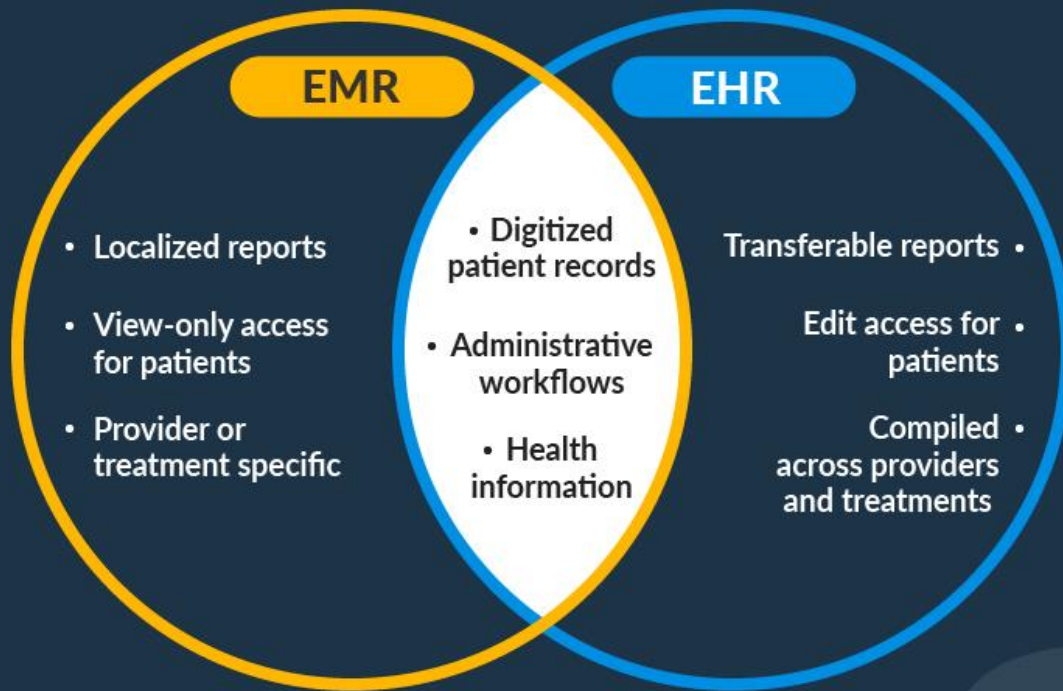
What we need

- Integration and Interoperability
- Not creating another SILO of data that no one looks at

Integration of data ...
needs an
infrastructural
backbone



EMR vs. EHR



SelectHub

Adoption barriers

- Not all hospitals have electronic medical records
- Existing EMRs are data-loaded

Solutions

- Keeping data capture simple
- Easy to integrate into existing workflows
- CDAC

Envisioned Future

Patient generated information get integrated into a common dashboard

- Simple
- Interoperable
- Private and Secure
- Connects to HIS

We are not far from it !!



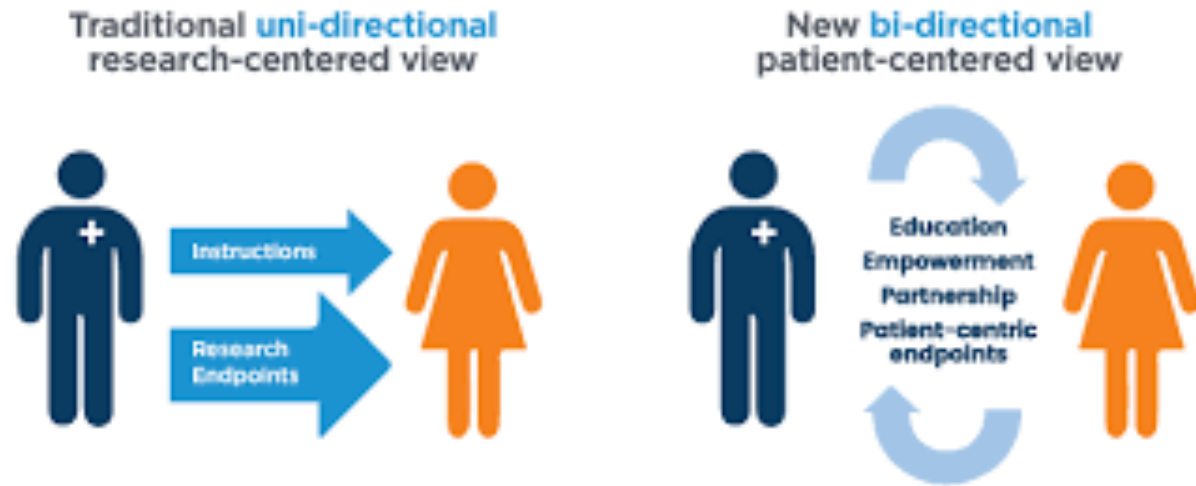
Remote monitoring

Integrated interoperable
digital EMR

Where does
this take us ?

Empower the patient

Shared decision making



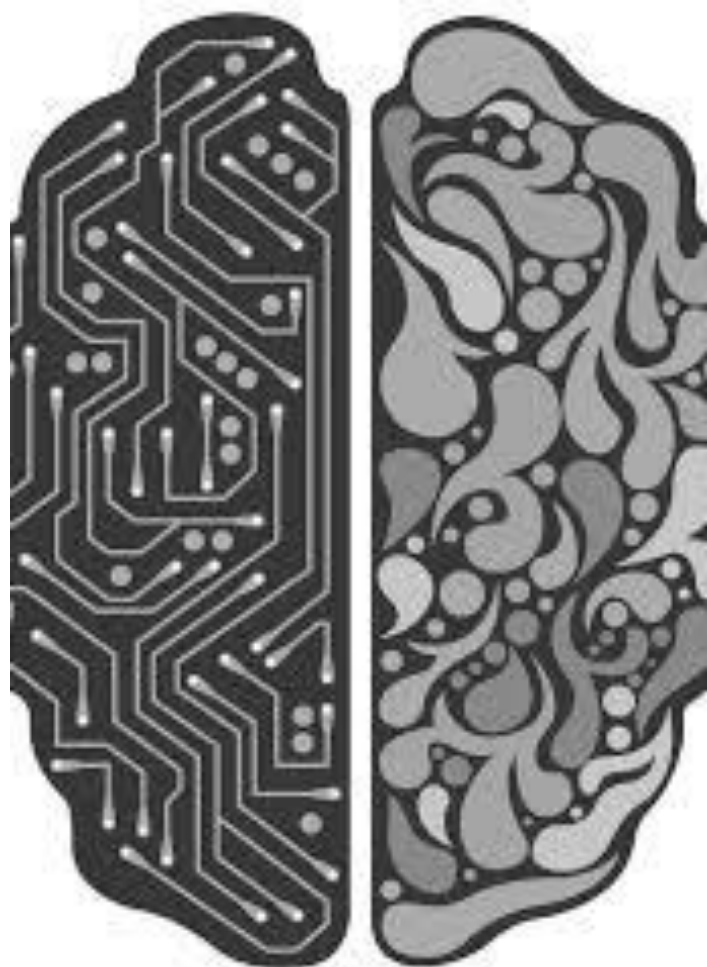
- Involve patients more actively in their treatment decisions
- Utilize data from remote monitoring and EMRs to inform decisions
- Improve patient satisfaction and treatment adherence

Better
continuum of
care – via
remote
monitoring



Virtual Care

A concept we need to embrace...



Digital biomarkers and EHR

Objective, quantifiable physiological and behavioral data collected through digital devices

Can be used to explain, influence, or predict health-related outcomes.

* Can include data from wearables, smartphones, and other digital devices

* Used to track treatment response, predict outcomes, and detect early signs of complications

* Enhances personalized treatment planning in radiation oncology

1999 – 2024

Have we made
patient
accessibility
better?





Thank YOU!

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- QIRAIL

Photo courtesy: Dr Vidya Konduru