COCIR/DITTA Virtual Event

Working together against cervical cancer

18 March 2021, 14:00 – 16:30 CET

COCIR/DITTA Speaker: Elena Dizendorf, MD, PhD

Manager BrachyAcademy at Elekta

What innovations coming from industry are best for tackling cervical cancer?

Scale-up of radiotherapy for cervical cancer in the era of human papillomavirus vaccination in low-income and middle-income countries: a model-based analysis of need and economic impact

Danielle Rodin, Emily A Burger, Rifat Atun, Michael Barton, Mary Gospodarowicz, Surbhi Grover, Timothy P Hanna, David A Jaffray, Felicia M Knaul, Yolande Lievens, Eduardo Zubizarreta, Michael Milosevic

Summary

Background Radiotherapy is standard of care for cervical cancer, but major global gaps in access exist, particularly in low-income and middle-income countries. We modelled the health and economic benefits of a 20-year radiotherapy scale-up to estimate the long-term demand for treatment in the context of human papillomavirus (HPV) vaccination.

Lancet Oncol 2019

Published Online
May 28, 2019
http://dx.doi.org/10.1016/

	Health parameters			Human capital return on investment		Full income return on investment	
	Patients requiring external-beam radiotherapy	Patients requiring brachytherapy	Life-years gained with radiotherapy scale-up	Nominal model	Efficient model	Nominal model	Efficient model
Base case values							
Low-income countries	1340413	1005310	2348608	−0·4	0·3	0·3	1·8
Lower-middle-income countries	4892966	3669725	6188537	1·6	4·2	4·3	9·7
Upper-middle-income countries	3120872	2340654	2861813	6·1	12·3	14·2	27·7
Total	9354251	7015689	11398958	2·5	6·0	6·5	13·8
Sensitivity analysis: advanced stage distribution							
Low-income countries	1623599	1282643	3359445	0·0	1·1	1·1	3·3
Lower-middle-income countries	5926692	4682086	9655660	3·0	7·0	7·2	15·4
Upper-middle-income countries	3780211	2986367	4480428	8·7	17·3	20·0	38·6
Total	11330502	8951096	17495533	4·0	9·5	9·9	22·1
Sensitivity analysis: integrated radiotherapy and vaccination scale-up							
Low-income countries	1284243	963183	2041140	−0·4	−0·1	0·3	0·9
Lower-middle-income countries	4729919	3547440	5936526	1·1	3·2	3·2	7·5
Upper-middle-income countries	3014362	2260772	2694691	5·6	11·4	13·4	25·87
Total	9028525	6771394	10672357	2·2	5·1	5·6	11·7

Return on investment is a ratio defined as the net present value (itself defined as the economic return on investment minus the cost of investment) divided by the cost of investment, all in US$.

Table 3: **Population health and economic effects of scaling up radiotherapy capacity for cervical cancer treatment, 2015–35**

After 20 years with an HPV vaccination program in place, 9.0M women would require EBRT and 6.8M women would require brachytherapy.

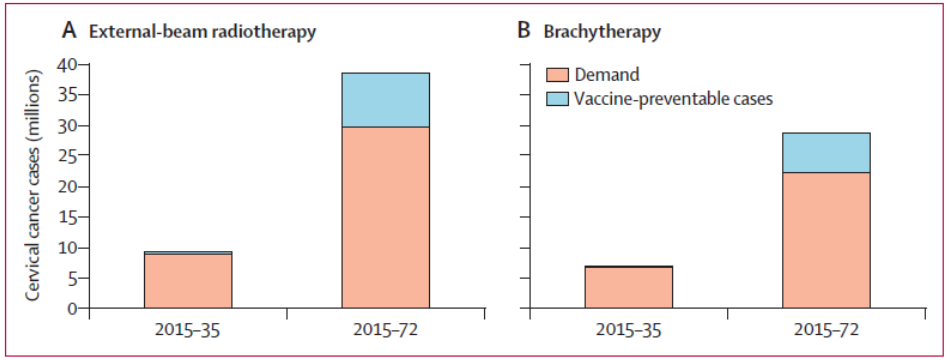
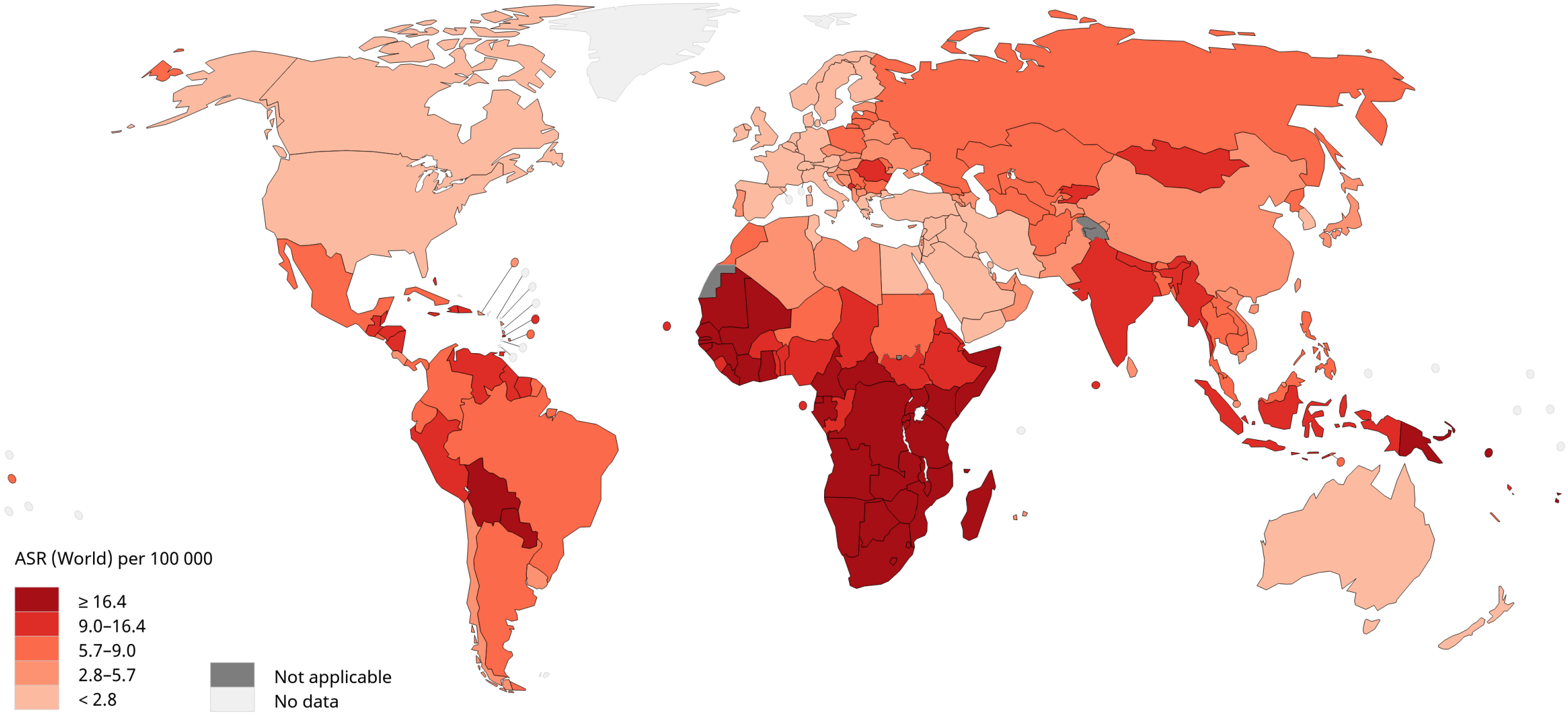


Figure 4: **Effect of universal human papillomavirus vaccination strategy on demand for external-beam radiotherapy and brachytherapy in low-income and middle-income countries**

By 2072 HPV vaccination is estimated to reduce cervical cancer by 22.9%, however 38.8M women would require EBRT and 28.8M women would require brachytherapy.

Rodin et al, Lancet Oncol 2019; 20(7):915-23.

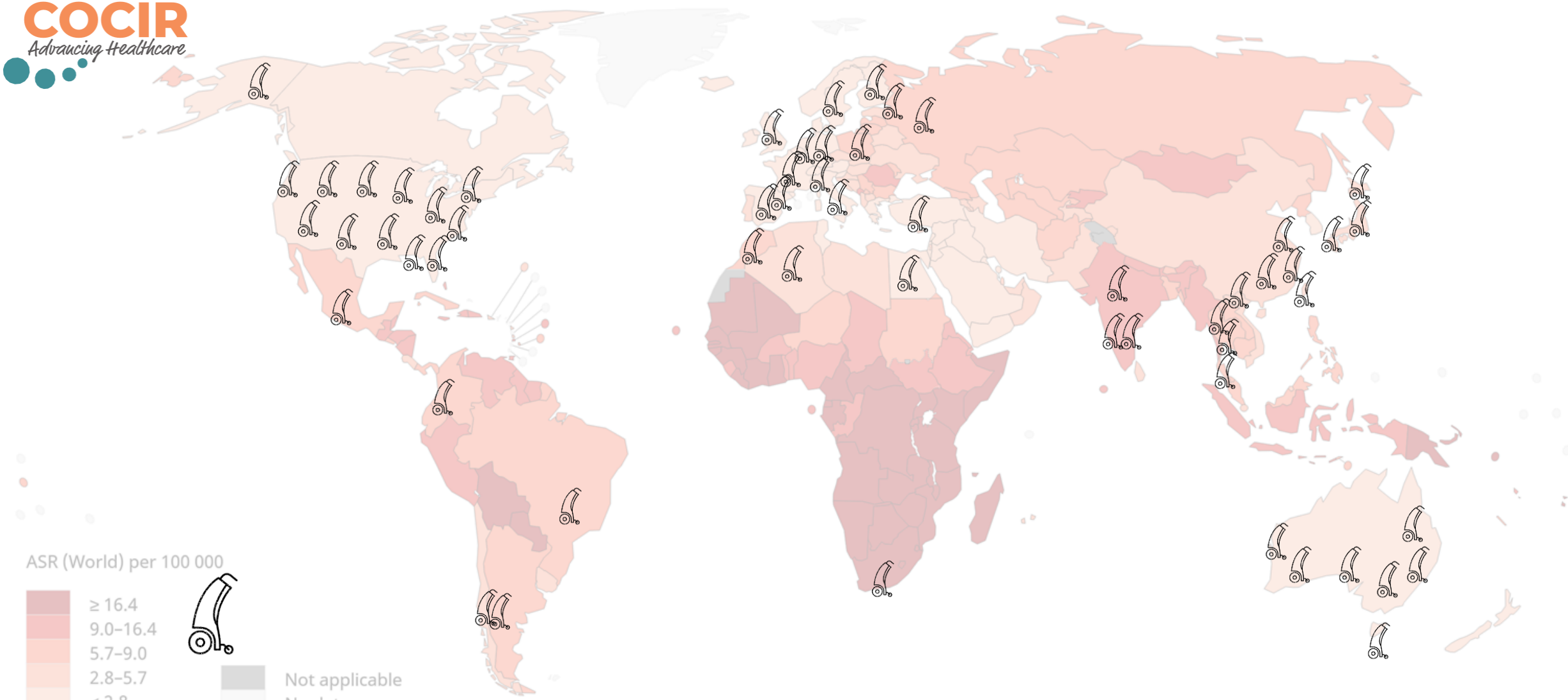
Estimated age-standardized mortality rates (World) in 2020, cervix uteri, all ages



Data source: GLOBOCAN 2020
Graph production: IARC
(http://gco.iarc.fr/today)
World Health Organization

COCIR
Advancing Healthcare

Estimated age-standardized mortality rates (World) in 2020, cervix uteri, all ages



Data source: GLOBOCAN 2020
Graph production: IARC (http://gco.iarc.fr/today)
World Health Organization

Expanding global access to radiotherapy

Rifat Atun, David A Jaffray, Michael B Barton, Freddie Bray, Michael Baumann, Bhadrasain Vikram, Timothy P Hanna, Felicia M Knaul, Yolande Lievens, Tracey Y M Lui, Michael Milosevic, Brian O'Sullivan, Danielle L Rodin, Eduardo Rosenblatt, Jacob Van Dyk, Mei Ling Yap, Eduardo Zubizarreta, Mary Gospodarowicz

Lancet Oncol 2015; 16: 1153–86
See Comment pages 1143–52

Radiotherapy is a critical and inseparable component of comprehensive cancer treatment and care. For many of the most common cancers in low-income and middle-income countries, radiotherapy is essential for effective

- The cost of scaling up radiotherapy in the nominal model in 2015–35 is **US$184 billion** across all LMICs. In the efficiency model the costs were lower: **$96.8 billion**.
- Scale-up of radiotherapy capacity in 2015–35 from current levels could lead to saving of **26.9 million life-years** in LMICs.
- The economic benefits of investment in radiotherapy are very substantial: using the nominal cost a net benefit of **$278.1 billion**, using the efficiency model a net benefit of **$365.4 billion**.

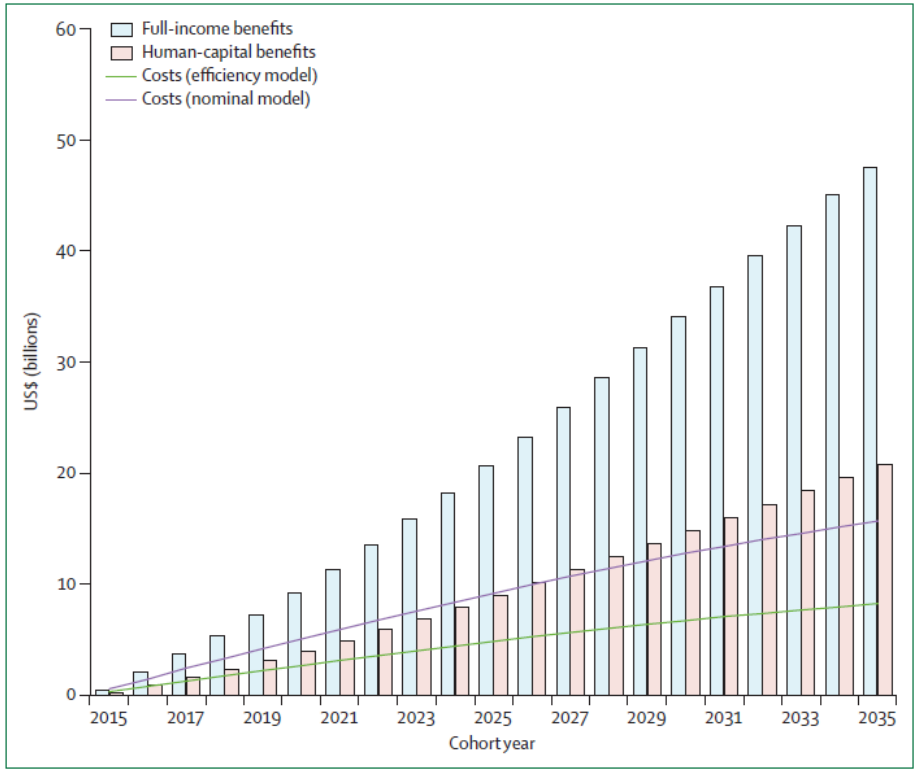


Figure 11: Cost and benefits of investments to scale up radiotherapy services in low-income and middle-income countries, 2015–35

Atun et al, Lancet Oncol 2015; 16:1153-83.

The WHO Global strategy to accelerate the elimination of cervical cancer as a public health problem

6.6 Strategic actions to achieve 90% treatment and care for cervical cancer cases

Improve access to radiotherapy and chemotherapy

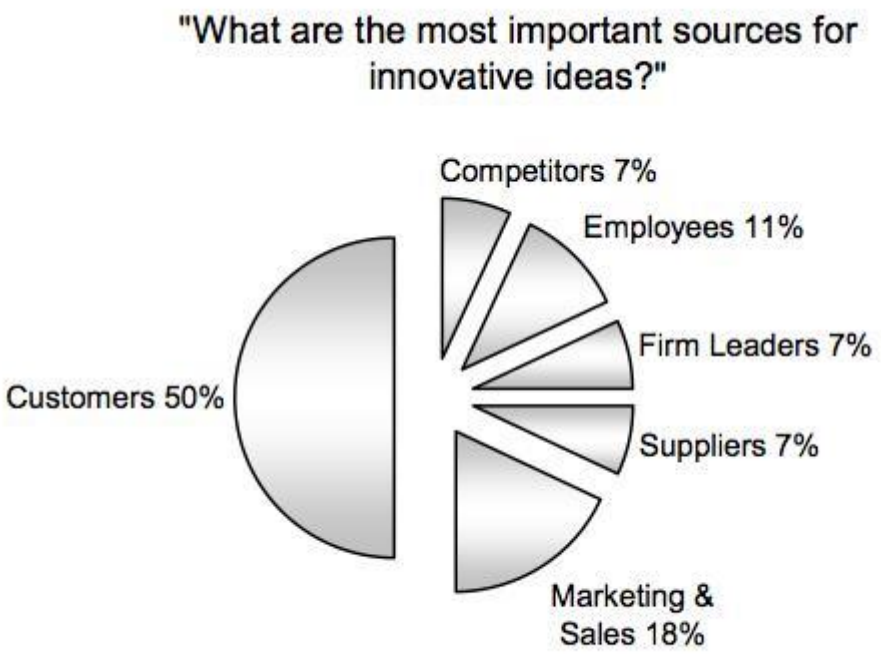
Most patients with cervical cancers in low- and middle-income countries present at stages that require radiation, so sustainable capacity for curative radiation therapy (external beam and brachytherapy) is critical.

8.2 Multisectoral collaboration

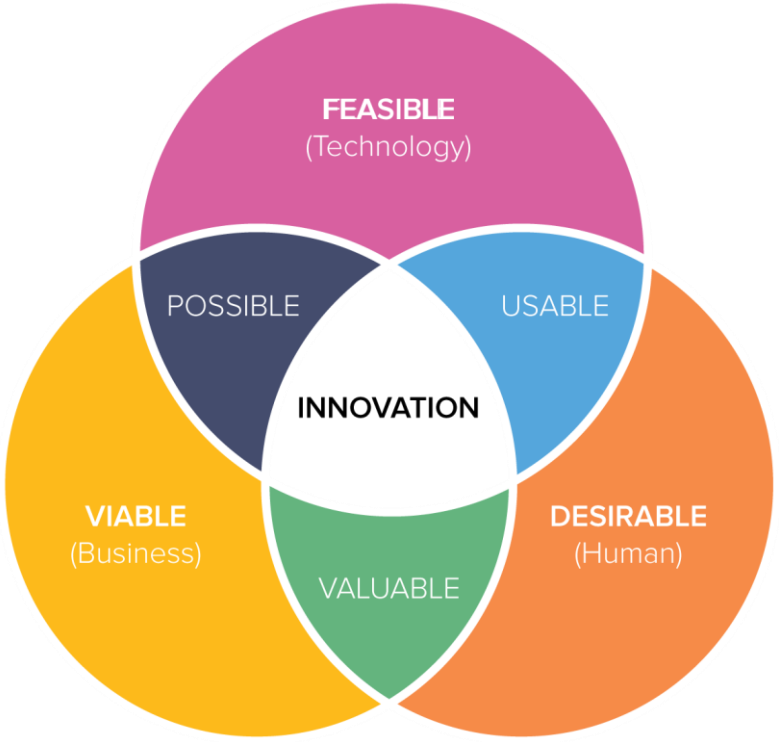
…to work closely with women, communities, civil society, young people, the media, the private sector, development partners, health professionals' associations, patients' groups and other stakeholders to achieve cervical cancer targets.

1. Improve access to radiotherapy

Where does innovation come from?



Source: Incremental Innovation



Source: UX Design

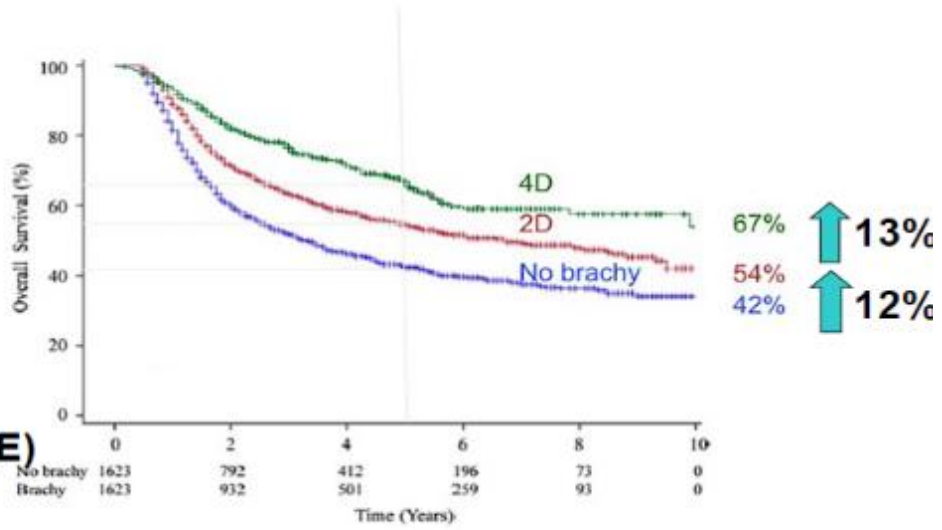
Brachytherapy improves patient outcomes

More patients with cervical cancer survive when IGABT is used

Overall Survival locally advanced cervical cancer:
the impact of brachytherapy

Total
25pp increase in
Overall Survival

from
„no brachy“
(Han)
to
„4D brachy“
(RetroEMBRACE)



Han et al, Int J Radiation Oncol Biol Phys 2013; 87:111-119.
Sturdza et al, Radiother Oncol., 2016;120:428-433.

Disclaimer: Clinical evidence does not reflect Elekta products.

EMBRACE I results – role of EBRT and BT

Image guided intensity modulated External beam radiochemotherapy and MRI based adaptive BRAchytherapy in locally advanced CErvical cancer

2008-2015 prospective study (N=1341) from 42 centers:

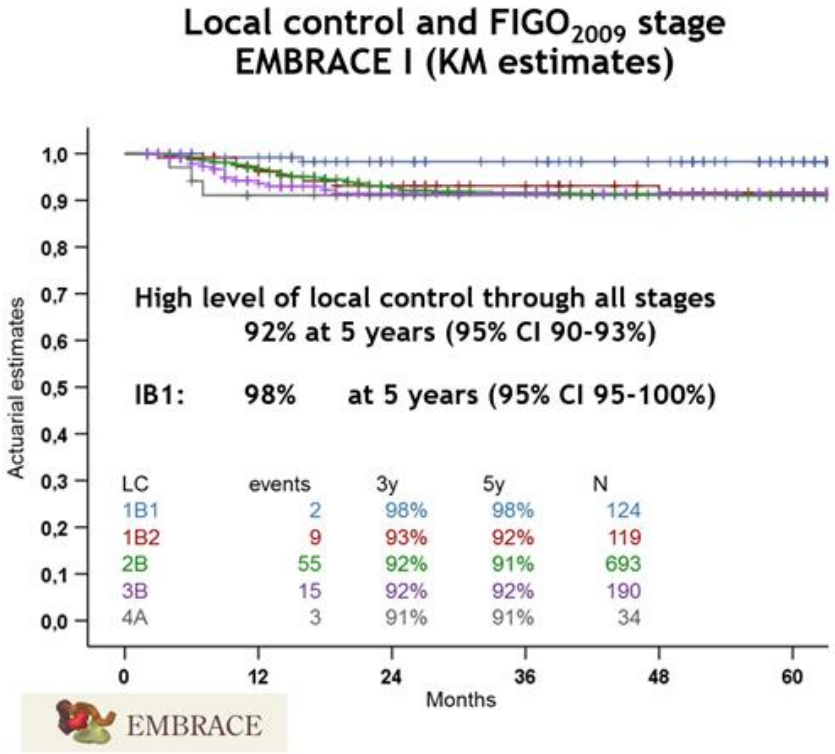
CT- or PET/CT- based EBRT

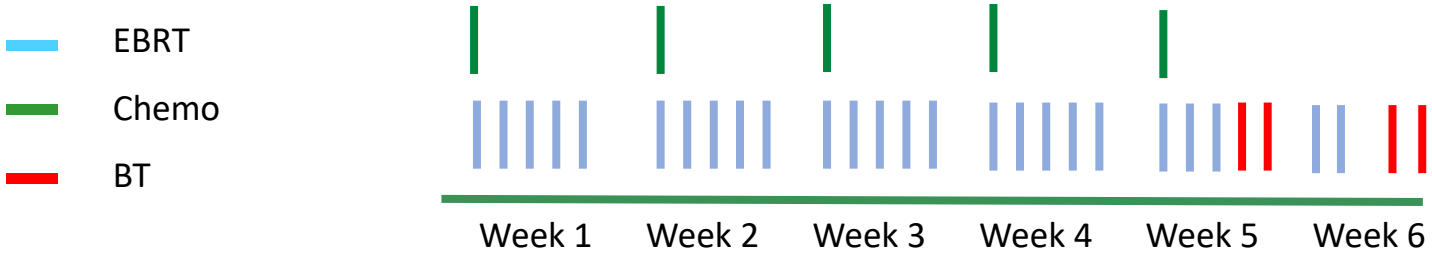
Concomitant Chemo

MR-based Brachy

- 5-year local control of 92%, pelvic control of 87%, disease free survival of 68%, overal survival 74%
- Grade 3-5 GU and GI morbidity of 6.5% and 7.5% respectively
- Median total overall treatment time 46 days

Pötter et al. Abstract #240 ESTRO2020





Ongoing EMBRACE II study – role of EBRT and BT

EMBRACE II intends benchmarking excellent local, nodal, distant control and survival rates, morbidity and Quality of Life outcome.
The most advanced radiation techniques currently available for cervix cancer treatment will be applied.

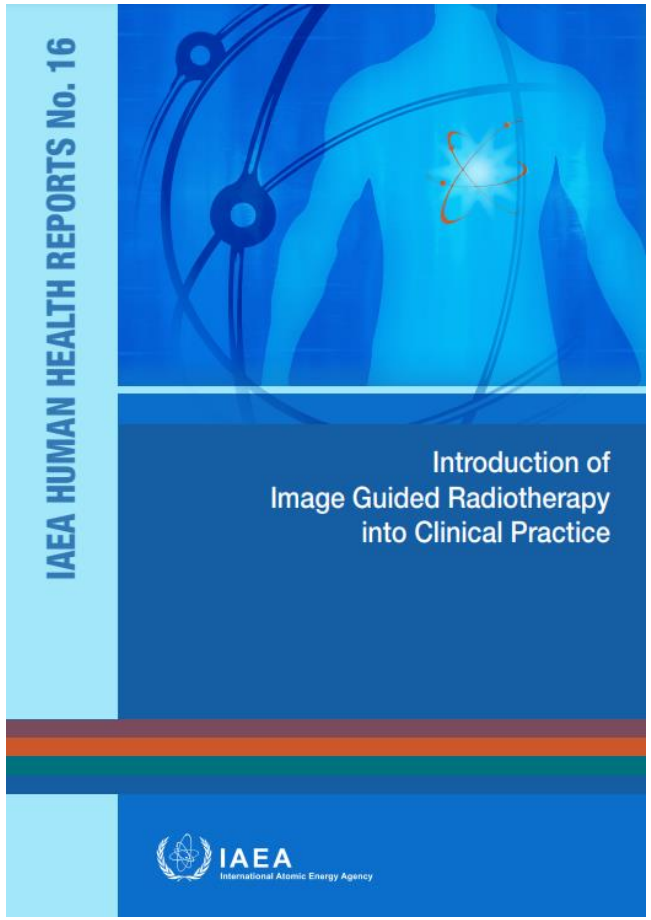
2016-... prospective study, 51 centers, accrual ends in 2021, >1000 patients so far

What is new:

- Systemic utilization of IMRT with simulnaneously integrated nodal boosting
- Daily systemic utilization of IGRT
- Increased use of IC/IS brachytherapy
- Targets for planning and limits for prescribed dose for EBRT and Brachy
- Combination with the highest standard concomitant chemotherapy
- Further reduction of overall treatment time

Source: www.embracestudy.dk

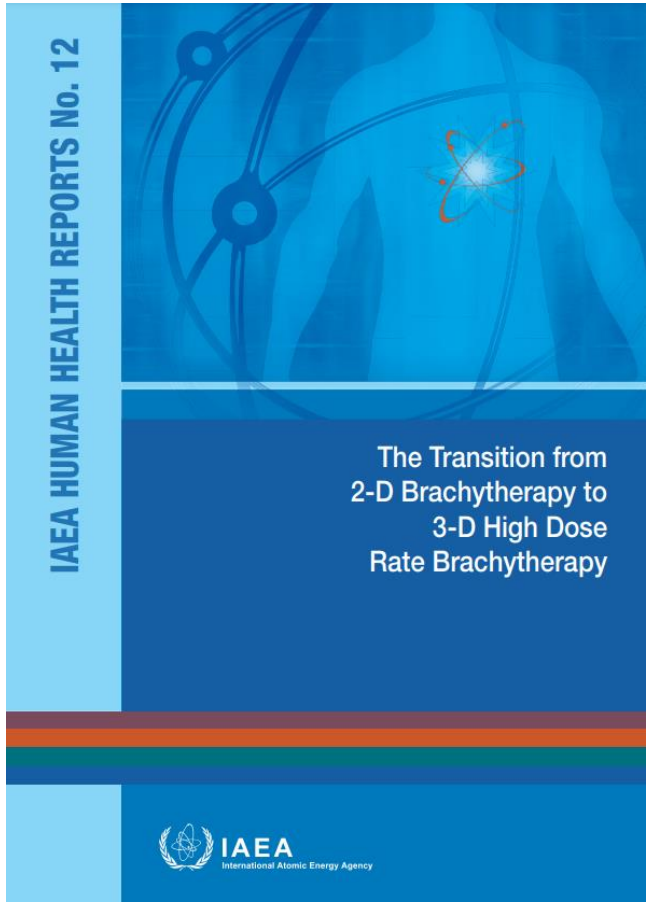
Equipment requirements for EBRT



- **Imaging:** CT with 4D capability
- **Treatment planning:** 3D-CRT, IMRT, off-line or on-line IGRT, peer review for plan evaluation, dose reporting ICRU 50, 62 and 83
- **Treatment delivery:** Linac with MLC, volumetric imaging capability, motion management

Introduction of Image Guided Radiotherapy into clinical practice. The IAEA Reports #16, 2019

Equipment requirements for brachytherapy



- **Applicators:** CT/MR compatible, treat multiple tumor stages (IC/IS)
- **Imaging:** CT/MR imaging solutions
- **Treatment planning:** applicator visualization using multiplanar reconstruction, plan optimization based on CTV and OAR volumes, dose reporting ICRU and GEC-ESTRO
- **Treatment delivery:** afterloader with dose check or in-vivo dosimetry during the treatment, refine detector technology

The Transition from 2-D Brachytherapy to 3-D High Dose Rate Brachytherapy. The IAEA Reports #12, 2015

Radiation therapy - six innovation themes

System integration

Access to RT

Adaptive combined therapy

Treatment certainty

Patient experience

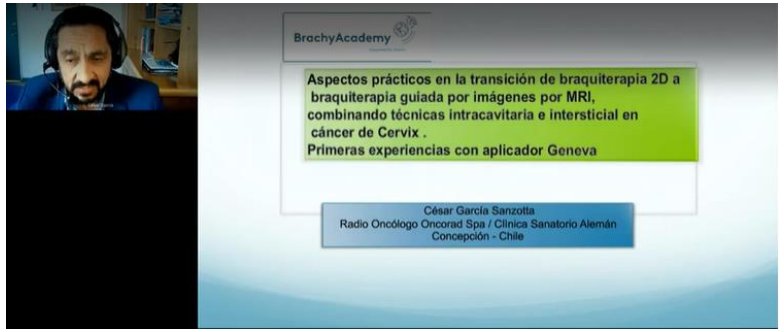
Workflow efficiency

Increasing adoption of 3D IGABT by education

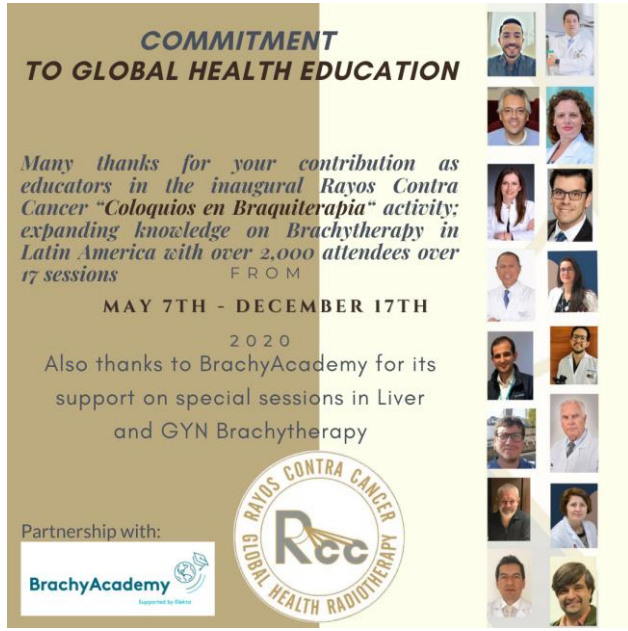
- 26 clinical workshops at the AKH, Vienna, Austria supported by BrachyAcademy (Elekta)
- 8 clinical workshops in Aarhus University, Denmark supported by Varian

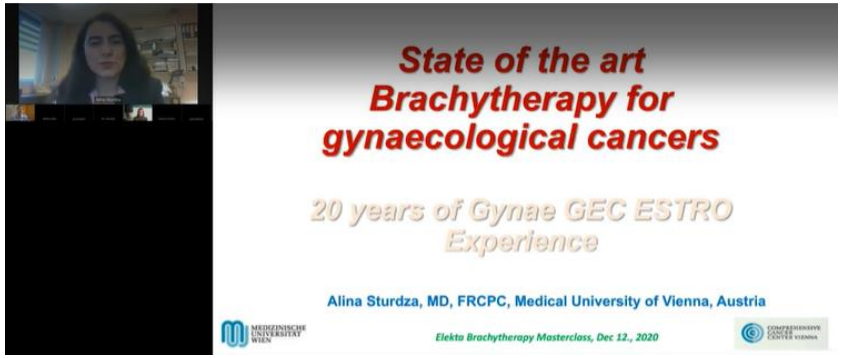
Educational webinars on Cervical Brachytherapy for LMICs

"Restructuring gynecological brachytherapy during the COVID-19 pandemic", October 2020



"Braquiterapia de Cérvix: La Transición de 2D a Braqui quiada por Imágenes. Primeras experiencias con aplicador Geneva", December 2020

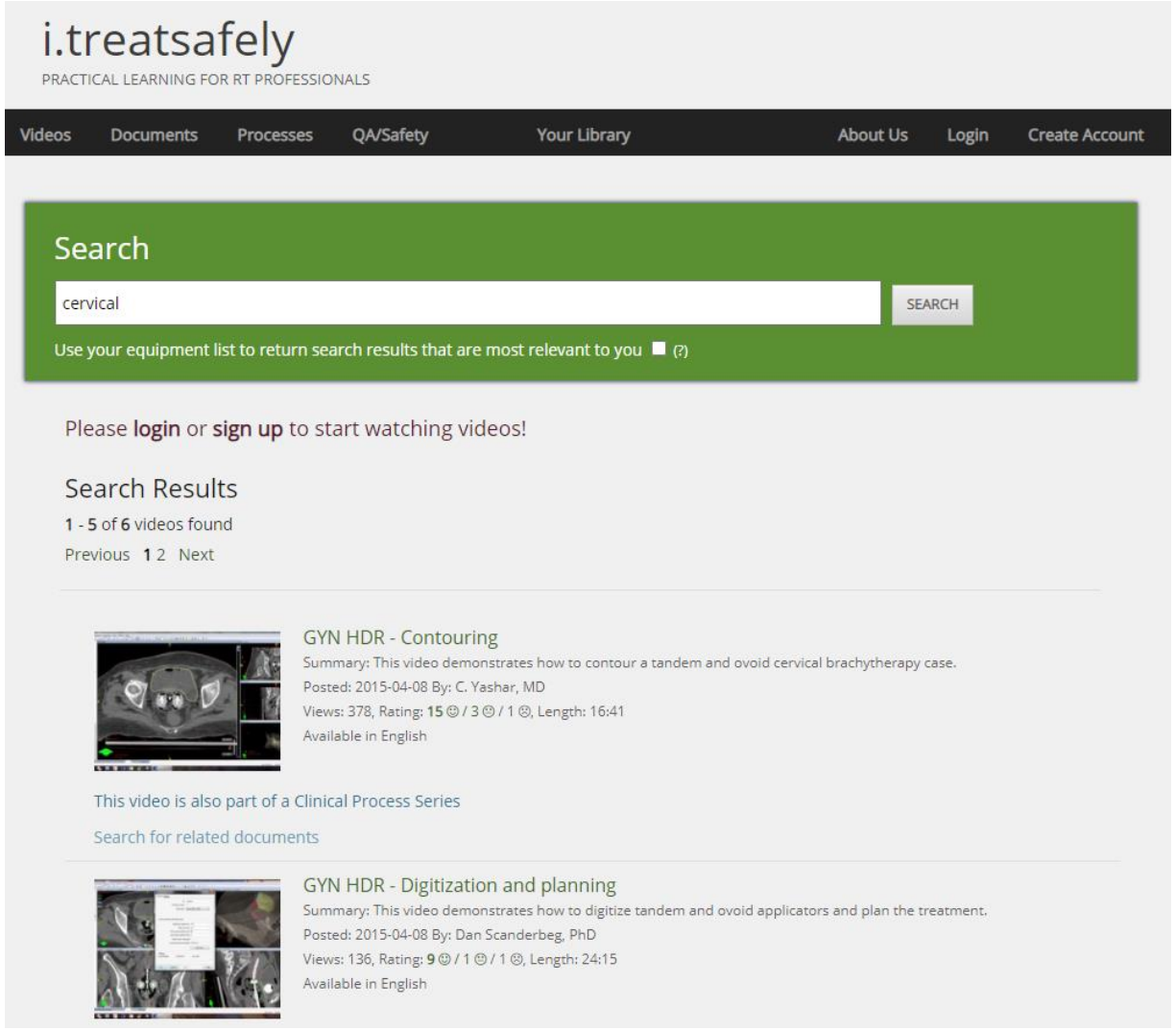




"GYN brachytherapy masterclass: transition from intracavitary to advanced interstitial", December 2020

"IGABT in intracavitary/interstitial cervical cancer", ENG and ESP, December 2020

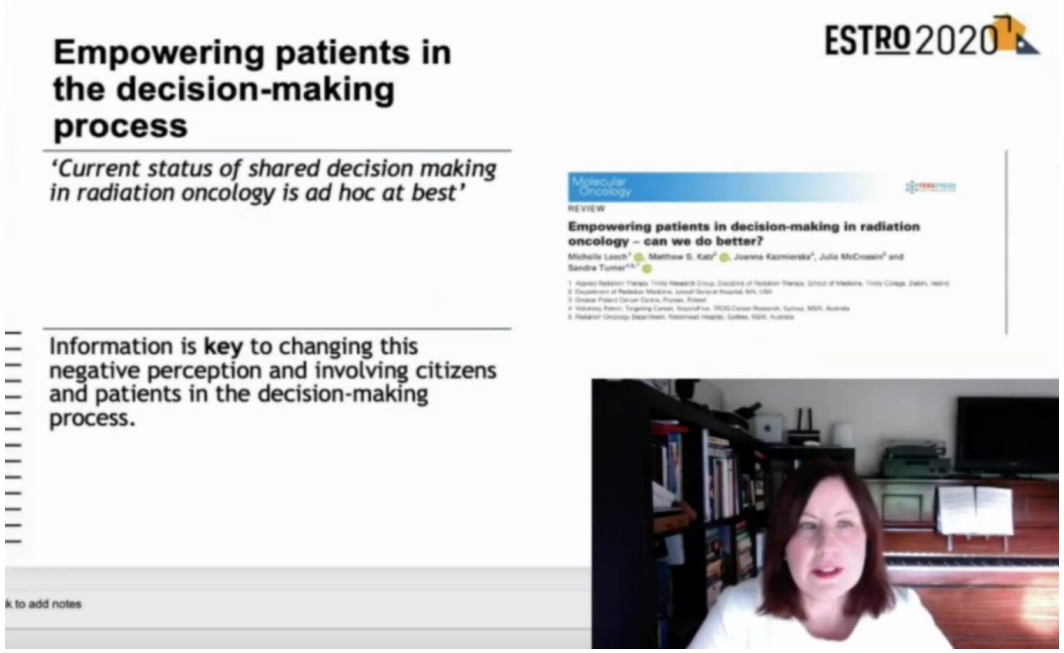
i.Treatsafely – educational portal for RT



2. Multisectoral collaboration

ESTRO 2020:
Empowering patients in decision-making in RadOnc

"…if by 2035, every cancer patient who needs radiation therapy had access to it, almost one million more lives would be saved every year worldwide. Every radiation oncology professional has … to contribute to making this happen. Debunking myths about radiation therapy, particularly its safety and efficacy, explaining in plain terms and with simple visual aids the process of radiation therapy and really listening to what patients fear about radiation therapy are ways that all radiation oncology professionals can contribute to this goal, regardless of location and resources".



Free online course for patients: **An Introduction to Radiation Oncology: From Diagnosis to Survivorship**: https://www.mooc-list.com/course/introduction-radiation-oncology-diagnosis-survivorship-futurelearn

Michelle Leech, Trinity College, Dublin (Ireland)
ESTRO 2020 Award Lecture

Presidential Symposium at ASTRO 2020
The Global Clinic: Radiation Oncology in the 21st Century

Dr. C. Norman Coleman, NCI, ECIC:

The challenge: how quickly we can achieve a "Century"? The approach should be not evolutionary but revolutionary: flexibility, rapid decision-making, creativity, funding opportunities, visionary governance, ready partnerships, work with non-profits, tax exempt, grants/awards.

"If you want to go fast, go alone. If you want to go far, go together"

African proverb