Impact of point of care CDS on patient journey, radiation dose exposure and sustainability

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Disclosures

R. Killeen

- Clinical advisor/shareholder xWave Technologies

The Problem

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- Use of medical imaging is increasing
- In Ireland, use of CT has doubled since 2009
- Approximately **2.5 Million** diagnostic imaging tests are performed in Ireland annually
- Demands on clinical radiology services are increasing, along with **wait times**
  - In 2021, there were **226,166** people waiting for a scan

The Problem

20 - 50% of radiology tests may be inappropriate or unnecessary

Inappropriate referrals lead to:

- Increased wait times
- Increased healthcare costs
- Delayed diagnosis
- Unnecessary Ionizing radiation

Quadruple Aim

Potential Solution

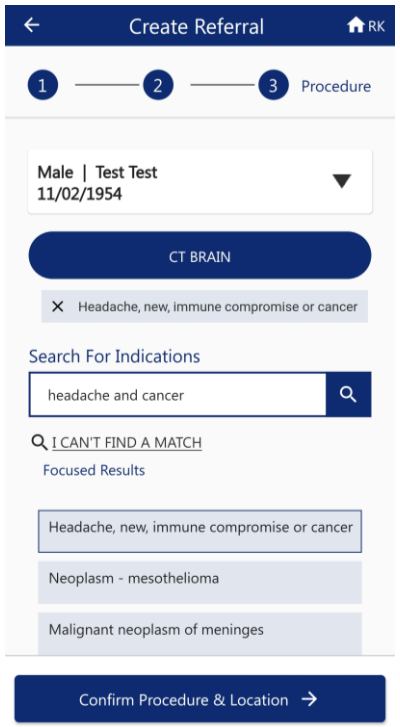
Clinical Decision Support (CDS)

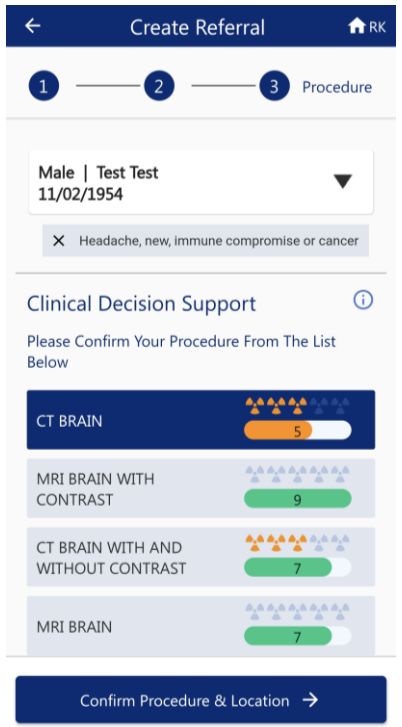
- Implementation of guidelines
- To reduce low value high-cost imaging
- Reduce unnecessary radiation
- ESR iGuide, based on ACR appropriateness criteria
- iRefer guidelines, RCR.

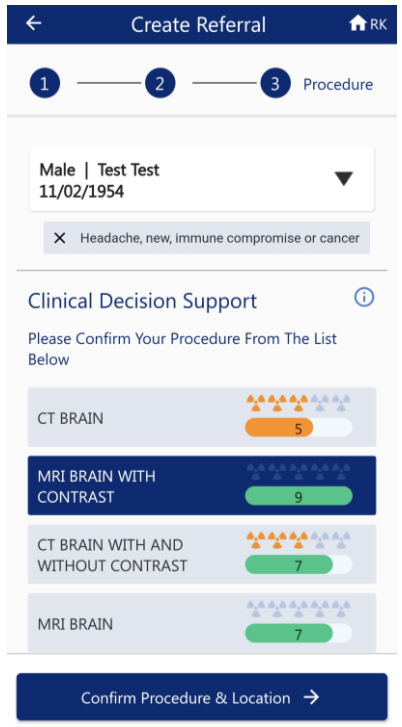
Web based CDS versus Point of Care

- Standalone CDS implemented in Ireland since 2015
- Knowledge of, and **access to web based guidelines** remains poor among physicians with limited impact

Point of Care CDS Tool







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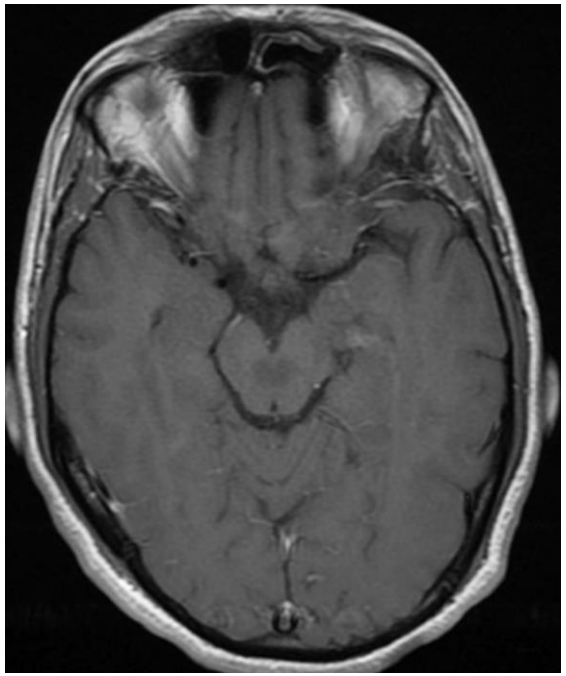
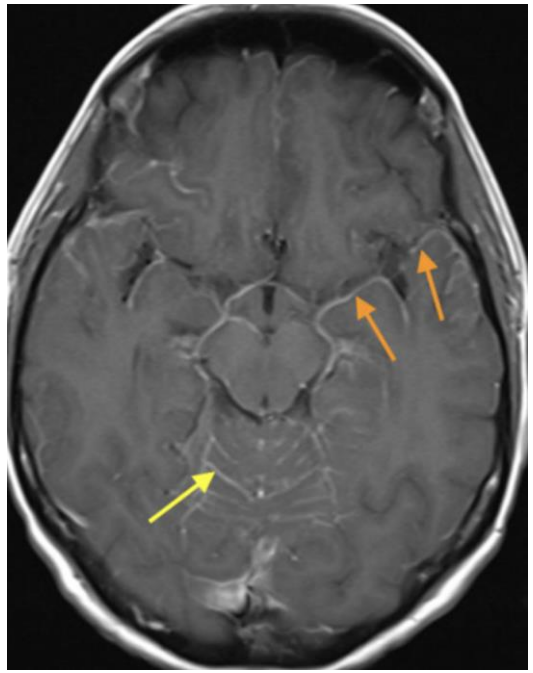

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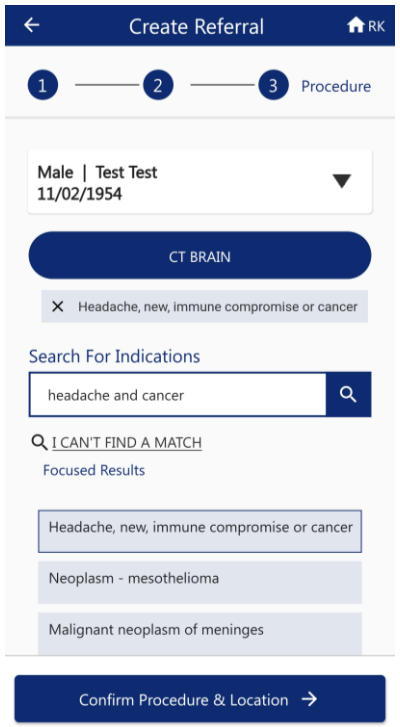

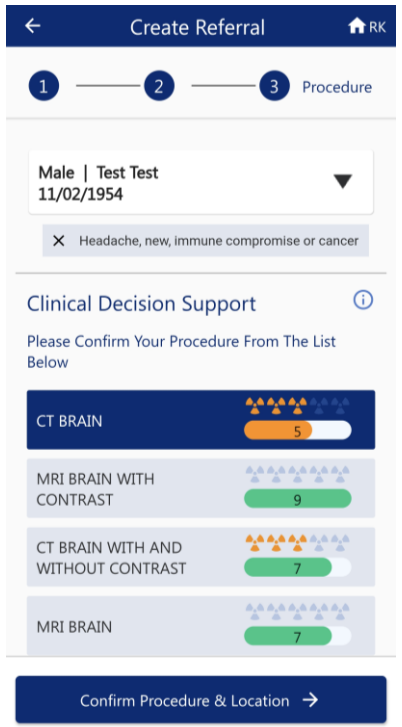

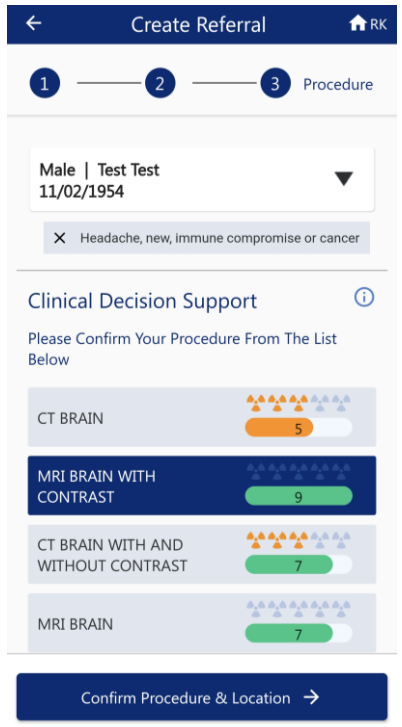

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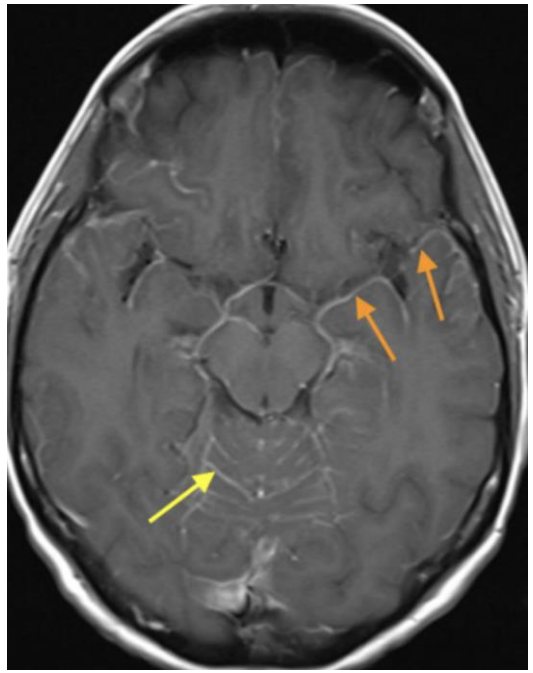
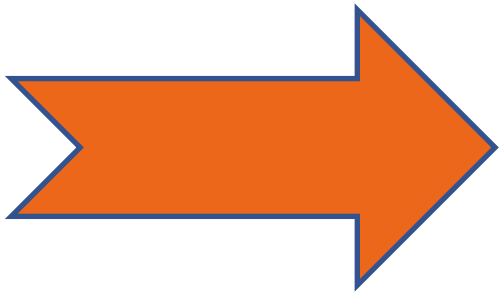


Point of Care CDS Tool

4 visits
4 scans
Radiation exposure
Delayed diagnosis



1 visit
1 scan
No Radiation
Rapid diagnosis

POC CDS implemented into tertiary referral hospital

To evaluate the referral pathway **pre- and post-POC CDST** implementation

Methods

- All **CT and MRI Neck** Exams from 2019 (pre-POC Tool) and 2021 (post-POC Tool) were collected retrospectively
  - Advanced Imaging
  - Duplicate Imaging
  - CT:MRI Ordering Behavior
  - Effective Dose per patient

Results: Demographics

	2019	2021
Patients	172	211
Sex %M(F)	61(39)	60(40)
Age (Ave SD)	56 17	56 17
Referrals	199	224
%Web-based CDST	100%	59%

↑23% Patient Volume

Results: Advanced Imaging

	2021		
2019	**Expected**	**Observed**	***P*-value**
199	244	224	<0.0001

➢ 20 Fewer scans than Expected

Results: Advanced Imaging

	2021		
2019	**Expected**	**Observed**	***P*-value**
199	244	224	<0.0001

- 20 Fewer scans than Expected
- **8.2% reduction from Expected**

Results: Duplicate Imaging

	2021		
2019	**Expected**	**Observed**	***P*-value**
54	66	26	<0.0001

➢ 40 Fewer scans than Expected

Results: Duplicate Imaging

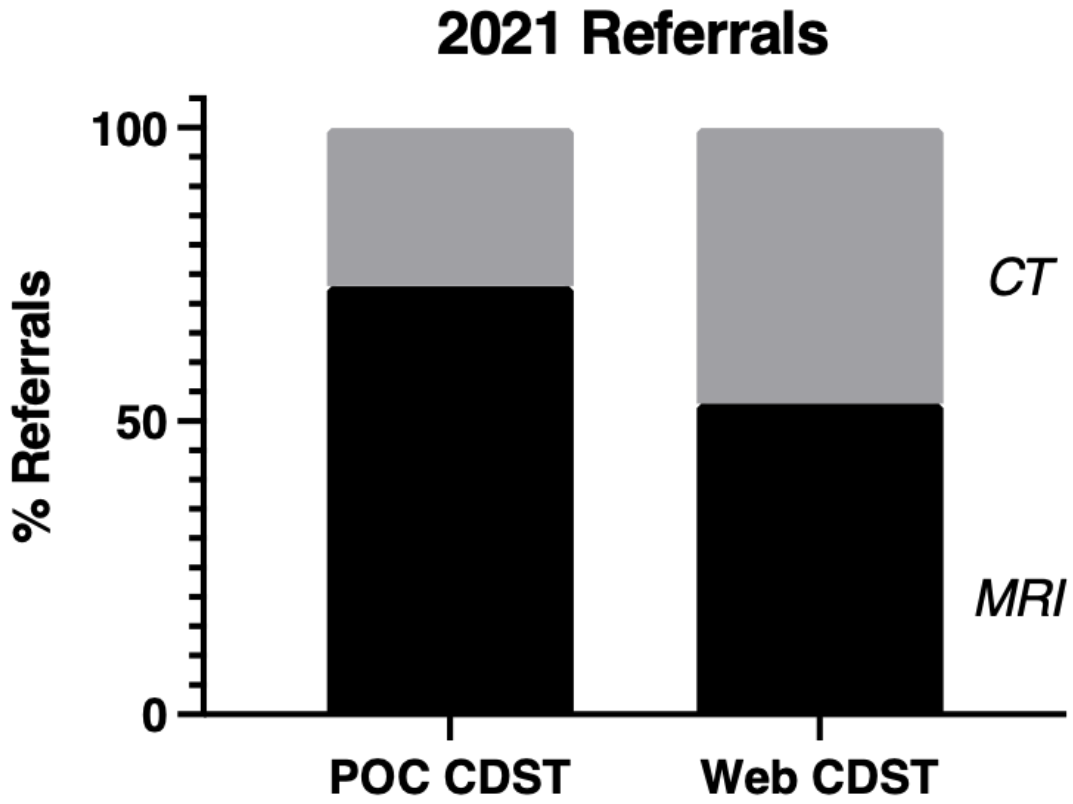
	2021		
2019	**Expected**	**Observed**	***P*-value**
54	66	26	<0.0001

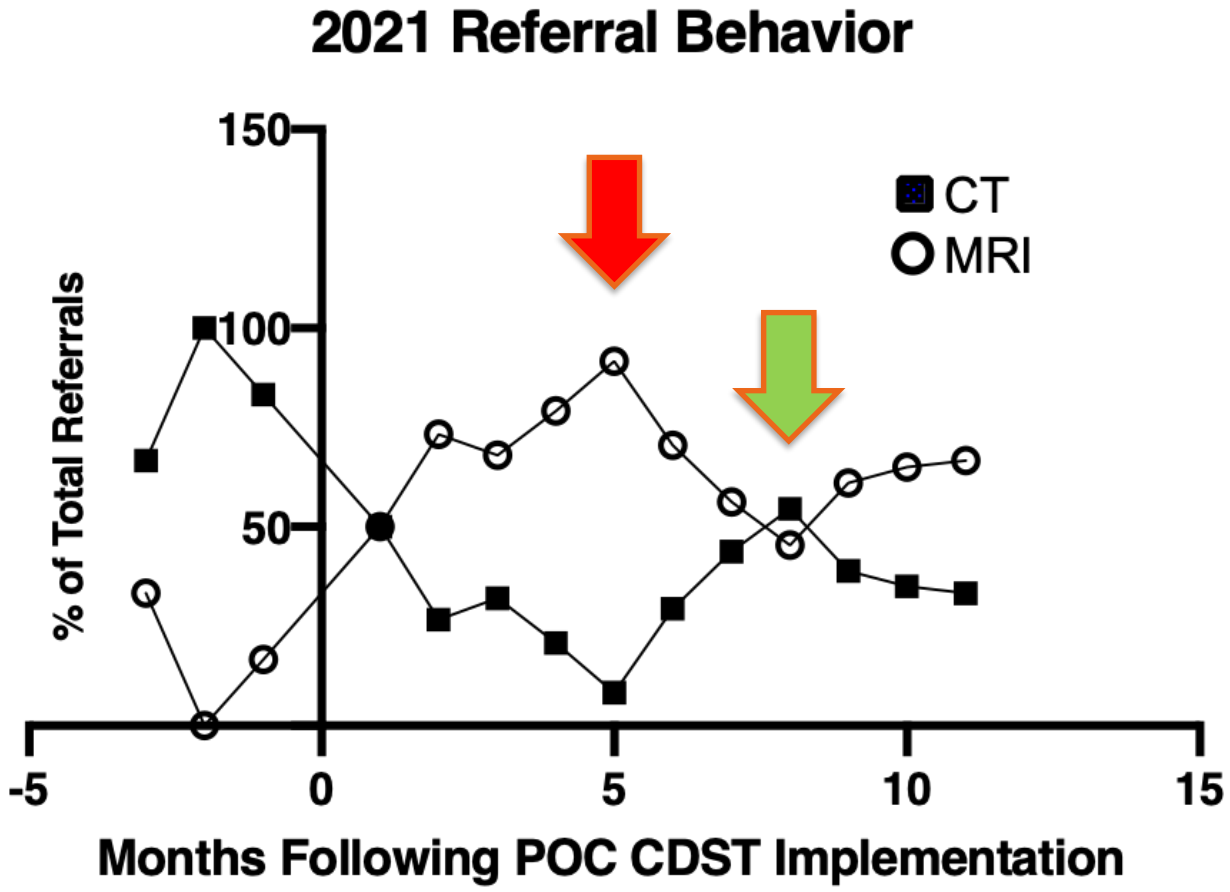
- 40 Fewer scans than Expected
- **61% reduction in unnecessary duplicate imaging**
- **73% reduction in simultaneous referral for CT and MRI**

Results: Referral Behavior

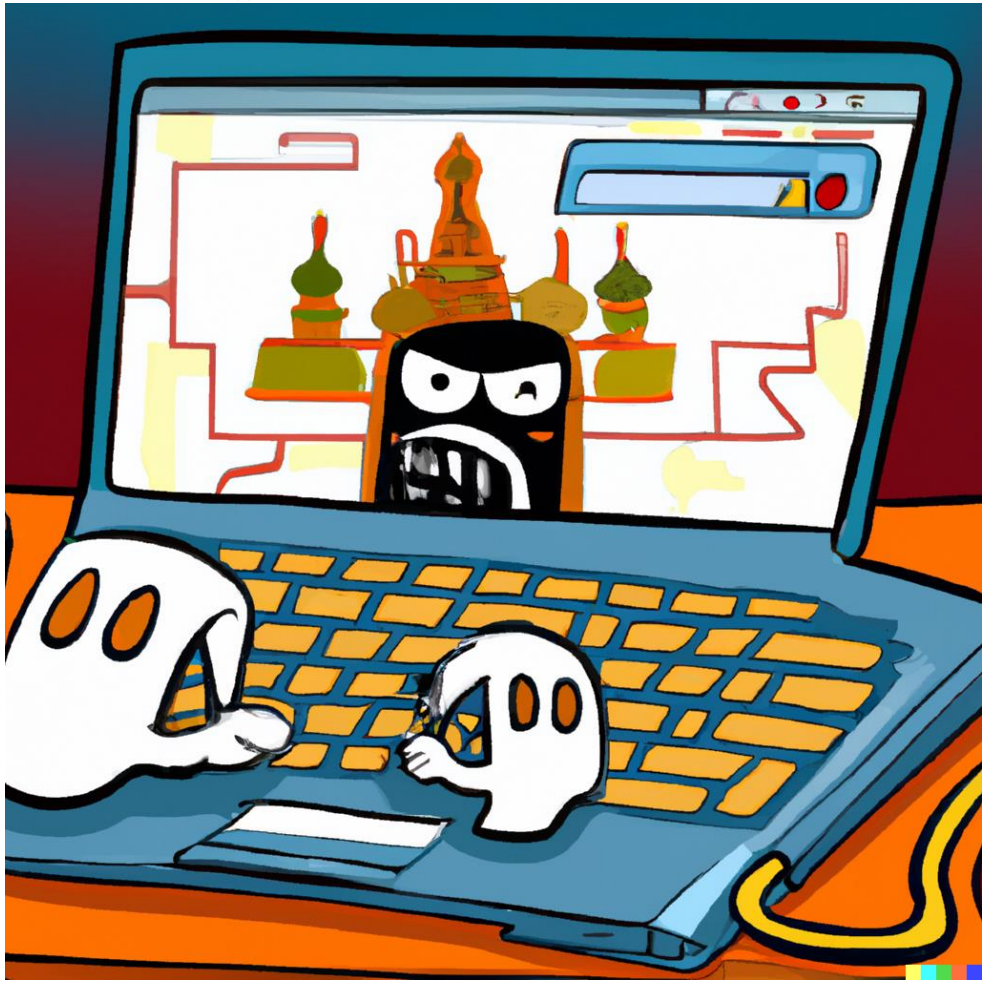
	2019	2021
MRI	102 (51%)	137 (61%)
CT	97 (49%)	87 (39%)

➢ OR: 1.50[1.02 – 2.22], *p*-value 0.049





Cyber-attack on Irish health service 'catastrophic'



Results: Radiation Dose

	2019	2021
# Patients	172	211
# CTs	97	87
mSv/patient	0.992	0.726

CT_{neck} = 1.76 mSv ED[1]
CXR = 0.02 mSv

➢ **27% Reduction in Effective Dose**

1. Atlı E et al., Diagn Interv Radiol. 2021

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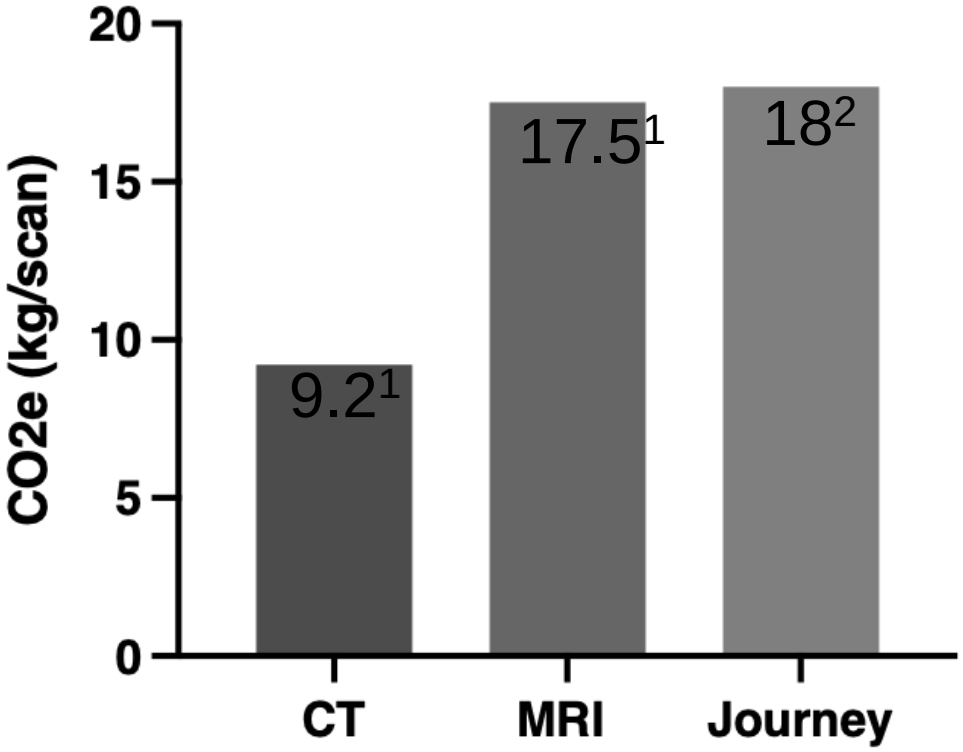
- **27% Reduction in Effective Dose**
  OR
- A reduction in **13 CXR per patient**

1. *Atlı E et al., Diagn Interv Radiol. 2021*

Results: Sustainability



	2019	2021
#Patients	172	211
Ave. kg/pt	15.6	13.5

- 20 Fewer Scans = **1.7 kg/pt CO_2e** saved by cutting unnecessary trips to the hospital
- **13.5% Reduction, *p*-value 0.0002**
- 2021 Climate action plan targets **3%** per year reduction[3]

Discussion: Sustainability

- The protection of the environment is **essential to the health and well being** of **everyone across Ireland**, Europe and Globally
  - By 2030, the government aims to **cut emissions by at least 30%**[1]
- Need to prioritize **reducing the carbon footprint** without sacrificing **quality of patient care**
  - By eliminating unnecessary imaging, we **reduced CO_2e by 13.5%**

What about Imaging Waiting Lists?

- In 2021, there were **226,166** people waiting for a scan[1]
  - Need to eliminate **9%** of current imaging volume to **eliminate wait times**

Discussion: Wait Times

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- There were **133,382** people waiting for a CT or MRI scan[1]
  - **5.3%** of current imaging volume

Discussion: Wait Times

- In 2021, there were **226,166** people waiting for a scan
  - Need to eliminate **9%** of current imaging volume to **eliminate wait times**
- There were **133,382** people waiting for a CT or MRI scan
  - **5.3%** of current imaging volume
  - The **POC CDST Eliminated 8.2%** in this retrospective study

4 Key Points

- Implementation of POC CDS resulted in

  - 1. **Reduction** in duplicate imaging by **73%**
  - 2. **Reduction** in the CT/MRI volume by **8.2%**
  - 3. **Reduction** in effective dose of radiation per patient by **27%**
  - 4. **Reduction** in carbon emissions **13.5%**

Acknowledgments

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Thank You

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