

Project Title

Care Redesign of Pelvic Image Guided Radiotherapy using Design Thinking

Project Lead and Members

Project lead: Francis Ho Cho Hao, Consultant

Project members:

- David Chia, Consultant
- Jeremy Tey, Senior Consultant
- Ooi Kiat Huat, Consultant
- Tan Teng Hwee, Registrar
- Chiau Ye Lin, Senior Staff Nurse
- Mohammed Hafiz Ahmad Fuad, Senior Radiotherapist
- Dr Diana Ramos Santos, Senior Manager

Organisation(s) Involved

National University Cancer Institute, Singapore (at Tan Tock Seng Hospital)

Project Period

Start date: Sep 2016

Completed date: Ongoing

Aims

To improve the experience of patients undergoing pelvic radiotherapy

Background

See attached

Methods

See attached

Results (see attached for more)

- A significant decrease in unplanned CBCT
- Each patient now receives 6 less CBCT, which is equivalent to 3,000 chest X rays per patient saved and the average throughput time is reduced by 159 minutes.
- Staff only take 3.5 minutes to complete the bladder scan, as opposed to 15 min of CBCT.
- The considerable reduction in manhour and unplanned CBCT have also created 321 new RT slots.
- As patients no longer have to spend longer waiting time undergoing unplanned CBCT in radiotherapy centre, patient's experience has greatly improved.

Lessons Learnt

- Traditionally, we have used the Cone Beam Computerised Tomography (CBCT) as form of verifying bladder filling in the radiotherapy treatment of our patients with pelvic cancer. This is because our radiotherapy machines have the capability to accurately assess bladder filling. This is still an essential step in Radiotherapy treatment because the CBCT also ensures that the tumour targeted is within the radiotherapy field. However the CBCT becomes a highly inefficient process when it is repeated for simply inadequate bladder filling 80% of the time. In order to save the precious radiotherapy machine time, staff time, we have gone in a scientific fashion to address this problem with rigorous methodology. Using the CPIP methodology, we correctly identified the root cause to our problem. However, the key of our success was the identification and implementation of readily available technology in the form of the automated bladder scanner to solve our problem. We chose to innovate the use of the bladder scanner for non traditional indications. The bladder scanner has been used routinely in the inpatient setting of assessing urine volume in patients with bladder issues. Although the bladder scanner is not as accurate as the cone beam CT, it served as a very successful screen for the bladder fullness which is critical to establish prior to pelvic radiotherapy.

- 6 months on, the unplanned CBCT remains below 5%, just one quarter of previous rates. The outcome of this project has also justified the purchase of this bladder scanner in our department. We have since also made this a new standard of care for all patients who are undergoing pelvic radiation to undergo bladder scanning.

Conclusion

This project showcase how design thinking can be an integral part of quality improvement in Singapore healthcare.

Additional Information

Design Thinking is a proven methodology is solving problems and innovation in many other industries. In healthcare, it is in its infancy stage. We hope with this project to showcase the capabilities of design thinking in care redesign and improving the quality of care delivered to our patients. We believe that this methodology is translatable and scalable to other specialties in medicine and it can have a significant impact without costing a bomb.

Project Category

Care Redesign

Keywords

Care Redesign, Quality Improvement, Improvement Tool, Design Thinking, Patient Journey Mapping, Patient Experience, Radiology, Oncology, Cost Savings, Time Savings, Safe Care, Waiting Time, National University Cancer Institute, Pelvic Cancer, Pelvic Radiotherapy, Cone Beam Computerised Tomography, Bladder Filling, Radiation Exposure

Name and Email of Project Contact Person(s)

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Care Redesign of Pelvic Image Guided Radiotherapy Using Design Thinking

Empathise

Background : CBCT in pelvic RT

Proto Journey Map

Interview

- Users = Patients(5), RadioTherapist(3), Drs(4), Nurses(2), Admin(1)
- Proto persona as a point of reference.

Observe

- User Journey maps
- Task Time, Waiting Time

Probe

- Pain Points
- What would be a dream come true?

Who thinks it's a problem?

- Patient:**
 - Trouble convincing Radiotherapist his bladder was full
 - Spending up to 3hrs at RLIC for pelvic RT due to repeat CBCT
 - Unplanned CBCT = extra radiation / cost
- Radiotherapy staff:**
 - Reluctant to believe patient's bladder is full (poor track record) - 44%
 - Inadequate patient education leading to poor prep - 52%
 - Patients non compliance to anti flatulence diet - 50%
 - Unplanned CBCT disrupts treatment schedule (downstream effect)
 - Service recovery (for delayed patients) is time consuming
- Institution:**
 - Diminished linear accelerator capacity
 - Unplanned CBCT results in extra manpower costs/opportunity cost

6 month Retrospective Review

Characteristic	Value
Age	Median (range) 73 (62-87)
Gender	Male : Female 40 : 0
Ethnic Group	Chinese 35
	Malay 3
	Indian 1
	Others 1
Primary site of malignancy & Radiation	Prostate 3/3
	Anal 2
	Bladder 3
Radiation dose	Median (range) 70.25Gy (50.4 - 79.2)
No of radiotherapy fractions	Median (range) 41/fractions (28 - 41)
Bladder Filling Time	Median (range) 55minutes (30-100)

Proto → Engaging Persona : Mr P

- Retired and well educated
- Motivated to finish RT
- Expects each treatment to take < 1 hr
- Wants to convince staff of his full bladder

Define

Define

40 pts received pelvic RT over 6 mths

1109 pelvic RT sessions = 1109 planned CBCT

1403 CBCTs performed incl 294 unplanned CBCTs (repeated)

(1403-1109)/1403 x100% = 21% unplanned CBCT (74 hours of machine time)

Obedian et al (NY) reported 10.8% unplanned CBCT that is half compared to our centre (21%)

Bladder issues – 48.3%

Rectal issues – 33.6%

Tumour issues – 18.7%

Issue To reduce the percentage of unplanned CBCT in patients undergoing pelvic radiotherapy

Patient Population from 21% to 9% (bys>50%)

Magnitude of improvement over 5 months

Duration at the Radiotherapy Centre

Primary Objective

Secondary Benchmarking

Brainstorming the causes

Bowel	Bladder	Technical Issues	Patient Issues	Patient education
Small amount in RT field	Incontinence	Software fault	Weight loss	Non compliance
Excessive bowel gas	Steady under filling	Hardware fault	Hydration habits	Dop's understanding
Inconsistent voiding	Bladder overfilling	Bladder not visualised	Reliability of self-report	Mishear of bladder prep
Leading urine catheter	Delayed voiding	Delayed voiding	CBCT not available	Inefficient patient selection
Power bladder cathode back	Power bladder cathode back	Power bladder cathode back	CBCT not available	Timing of urine filling or after CBCT
Unable to provide accurate hydration	Unable to provide accurate hydration	Unable to provide accurate hydration	CBCT not available	Lack of patient education
Weak bladder contraction	Weak bladder contraction	Weak bladder contraction	CBCT not available	Lack of patient education

Ideate

ORIGINAL ARTICLE

Use of a prospective cohort study in the development of a bladder scanning protocol to assist in bladder filling consistency for prostate cancer patients receiving radiation therapy

Pre-GIOT Bladder Scan to accurately determine bladder fullness

Use of a Urine Color Chart to Monitor Hydration Status in Nursing Home Residents

Urine colour chart for self monitoring of hydration status

Prototype

Empathise Define Ideate Prototype Test Share

Prototype

- Loan bladder scanner x 3 brands
- Pilot for 2 weeks on prostate ca pts only

Test

- Trial on 10 patients halfway through pelvic RT
- Scan all prior to CBCT

User Experience (UX)

- Bottle necks / Space/ Not enough nurses
- Inter operator variability
- 100% uptake by patients & staff

1st Iteration

- Bladder scan behind curtain
- Role Redesign : Radiotherapists to do bladder scan

2nd Iteration

- Purchase scanner based on UX (user friendliness)
- Purchase 2nd machine (machine availability issues)

RAPID PROTOTYPING : Bladder scan

Test RESULTS

PRE

40 pts received pelvic RT over 6 mths

1109 pelvic RT sessions = 1109 planned CBCT

1403 CBCTs performed incl 294 unplanned CBCTs

(1403-1109)/1403 x100% = 21.2% unplanned CBCT (73.5hrs of machine time)

POST

57 pts received pelvic RT over 5 mths

1571 pelvic RT sessions = 1571 planned CBCT

1667 CBCTs performed incl 96 unplanned CBCTs

(1667-1571)/1667 x100% = 5.8% Unplanned CBCT (24hrs)

IMPLEMENTATION RESULTS

Percent of unplanned CBCT by month

Intervention Implementation

Uptake of interventions reached 100% in 3 months

13.3% difference in mean unplanned CBCT comparing pre vs post intervention (95% confidence interval 9.78% - 16.8%; p = 0.0004 using 2 sample T test)

Staff & Institution

- Each patient receives 6 CBCT less (3000 CXR)
- Average patient throughput time reduced by 159 mins
- 4815 mins of linac time saved from 13.3% reduction of unplanned CBCT ~ 321 new RT slots created
- Annualised Cost savings of \$132,894

TELLING THE STORY : VALUE