

# Applying Cloud-Based Technology and Multi-Institutional Participation to Guide Best Practice in Treatment Planning

S Quirk<sup>1</sup>, H Morrison<sup>2</sup>, N Logie<sup>1</sup>, P Grendarova<sup>1</sup>, T Phan<sup>1</sup>, K Long<sup>2</sup>, D Graham<sup>2</sup>, T Meyer<sup>1</sup>, B Nelms<sup>3</sup>, M Roumeliotis<sup>1</sup>

<sup>1</sup>University of Calgary, Calgary, AB, Canada, <sup>2</sup>Tom Baker Cancer Centre, Calgary, AB, Canada, <sup>3</sup>Canis Lupus LLC, Merrimac, WI

## MOTIVATION

In radiation medicine, treatment planning studies are often conducted in radiotherapy to evaluate differences between treatment modalities and planning techniques.

Most studies are conducted by **single institutions** comparing different treatment planning or delivery methods. The results are limited to the experience and technology of that institution.

**Cloud-based technology** can expand the concept of a planning study to many practitioners and institutions and increase the likelihood that best practice guidelines may be developed.

## AIM

To utilize cloud-based infrastructure towards improving best practice in treatment planning.

## METHOD

A comparison of **two planning study methodologies** was conducted, both demonstrated for synchronous bilateral breast cancer treated in deep-inspiration breath-hold. For both studies:

- dosimetric constraints were defined
- plans that met target coverage were included
- normal tissue doses were compared

### Single-institutional:

The cohort included all bilateral breast cancer patients treated between 2015 and 2018.

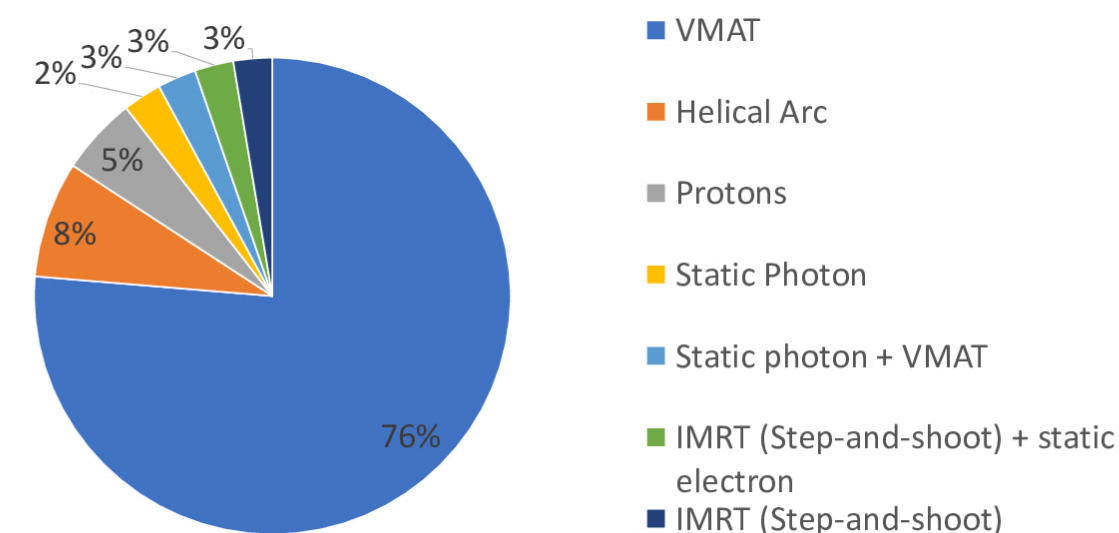
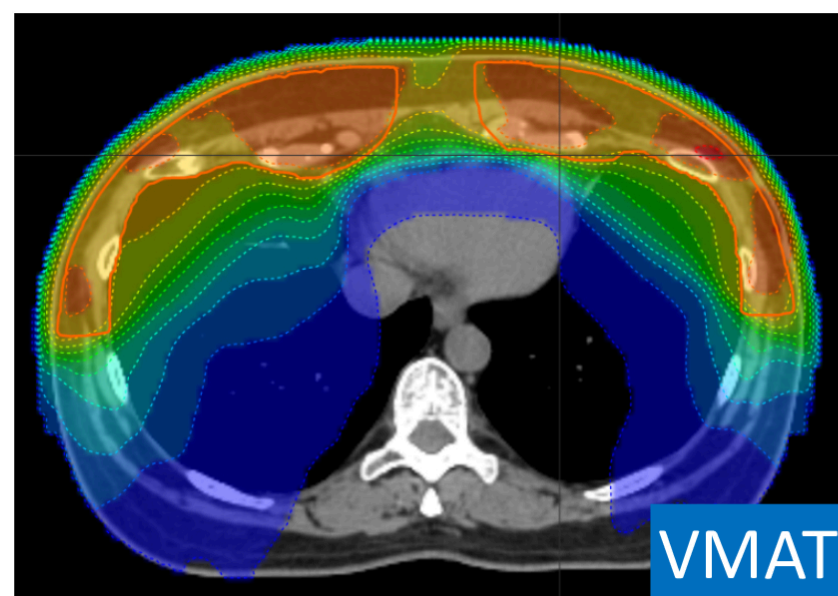
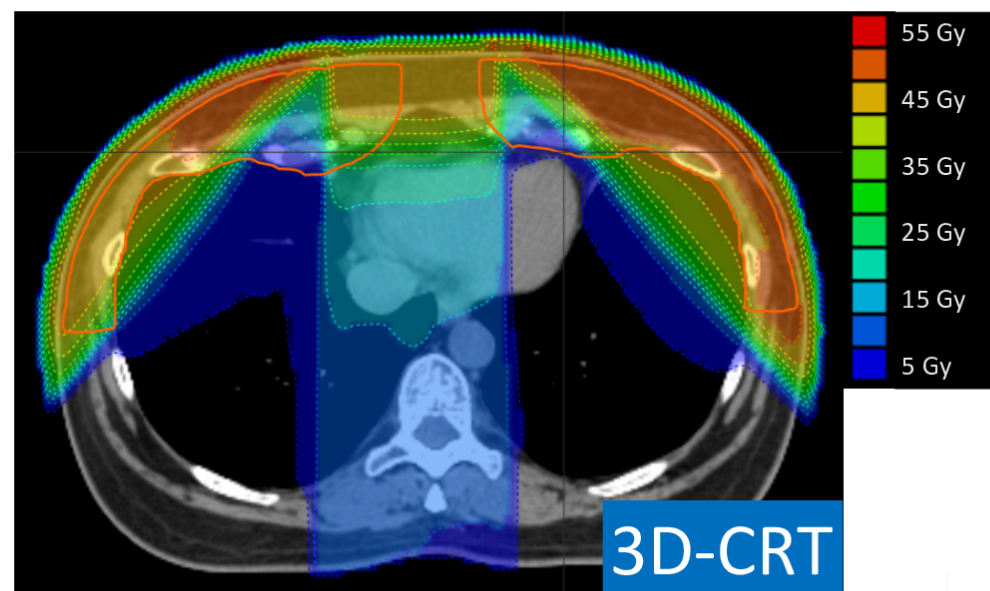
### Multi-institutional (cloud-based):

The cloud-based ProKnow plan study quality system (Elekta AB, Stockholm, Sweden) was used. Participants create a treatment plan for the representative patient using any delivery or planning technique.

## RESULTS

Synchronous bilateral breast cancer was chosen due to both the complexity of the site, no clear 'best practice' evidence in the literature. This site has relatively low incidence and no single institutions having many cases per year<sup>1</sup>. Contouring<sup>2</sup> and treatment goals<sup>3</sup> followed standard breast radiotherapy

Standard breast tangent, 3D-CRT techniques are often used but may not accommodate the complexity.



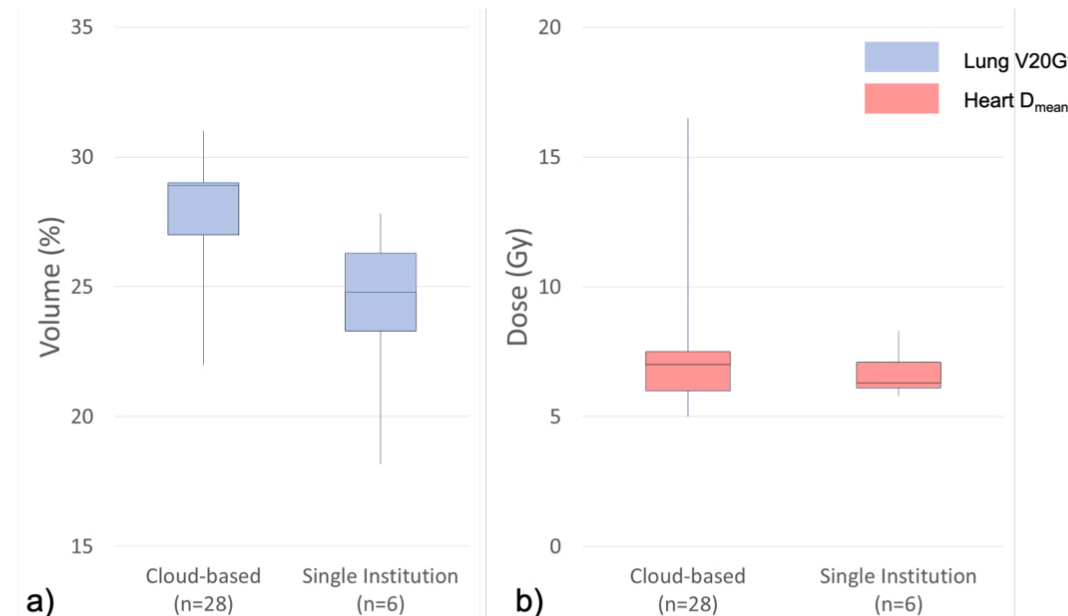
### Single-institutional:

There were a total of 6 patients treated with synchronous bilateral breast cancer between 2015 and 2018.

### Multi-institutional (cloud-based):

There were a total of 36 respondents, 28 were planned using VMAT and were included for further analysis.

## NORMAL TISSUE COMPARISON:



Comparison of normal tissue dose for a) **lung** and b) **heart** metrics between the **multi-institutional** (cloud-based, single-patient multiple planner cohort) and **single-institutional** (the multi-patient, single planner cohort).

## CONCLUSIONS

The results of the **multi-institutional** study - even when limited to a single treatment technique (i.e. VMAT) - show variation similar to the variation reported in the **single-institutional** study with different patient anatomies.

Single-institutional studies are limited by available planning/delivery options, optimization/dose calculation algorithms, team expertise, and bias related to these factors.

This study demonstrates the capability of **cloud-based infrastructure** and multi-institutional studies to contribute towards determining best practice guidelines.

## FUNDING SUPPORT, DISCLOSURES, AND CONFLICT OF INTEREST:

B. Nelms is a co-founder of ProKnow and has a commercial interest in the technology used in this study.

## REFERENCES

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## CONTACT INFORMATION

squirk@ucalgary.ca