Driving mammography image quality improvement using AI in Guyana during the Covid-19 pandemic

M. Abdolell[1,2], S. Surratt[3], M. Dindial[4], V. Mango[3,5], G. Spear, E. Pollack[3,5], N. Collier[4], A. Finless[1], S. Schofield[2], A. Schweitzer[3,5], J. Surratt[3]

[1] Dalhousie University
[2] Nova Scotia Health Authority
[3] RAD-AID International
[4] Georgetown General Hospital Corp.
[5] Memorial Sloan Kettering
[6] NorthShore University HealthSystem
[7] Massachusetts General Hospital
[8] Densitas Inc.

Disclosures: M. Abdolell, CEO Densitas Inc; N. Collier, employee Densitas Inc; A. Finless, intern Densitas Inc; S. Schofield, employee Densitas Inc.

Background

- Guyana Ministry of Health reports that the breast cancer mortality rate in Guyana is 46.9% vs. a 6.9% global average.
- Guyana launched it first public sector breast screening program in 2019 at Guyana Public Hospital Corporation (GPHC), with assistance from RAD-AID International.
- Mammography exams are performed using a digital mammography unit at GPHC by a RAD-AID trained lead medical imaging technologist (MIT) who manages other MITs.
- RAD-AID radiologists typically visit GPHC to deliver onsite training and education to residents and MITs.

RAD-AID International

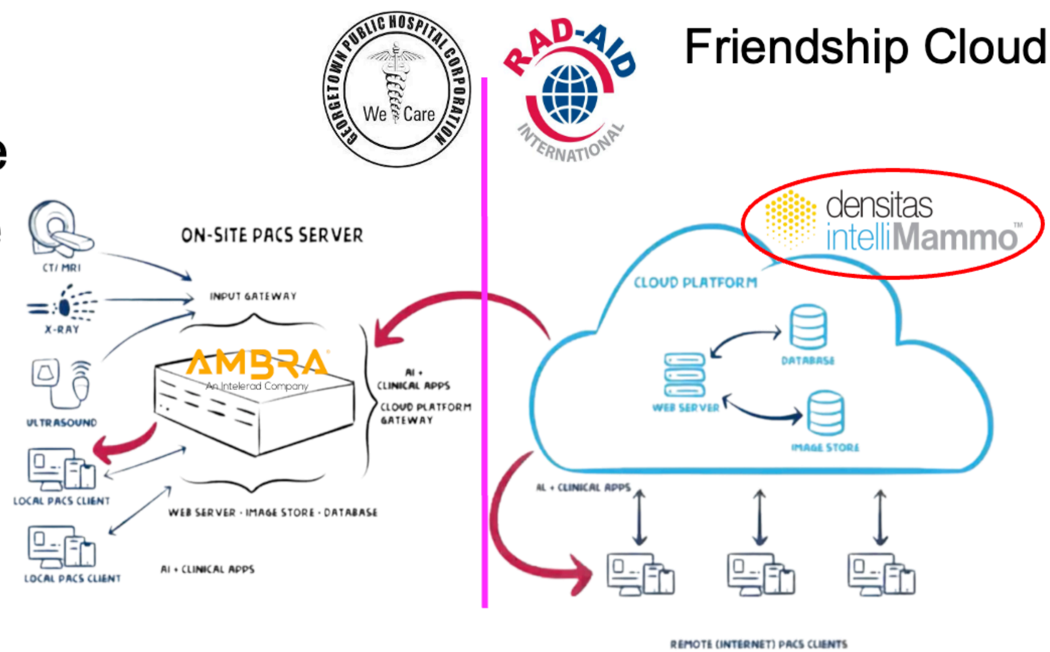
Mission

To improve and optimize access to medical imaging and radiology in low resource regions of the world for increasing radiology’s contribution to global public health initiatives and patient care.

RAD-AID – Densitas Guyana Project

“The initiative aims to improve early detection by supporting training and education to scale up the program’s impact in the public sector.”

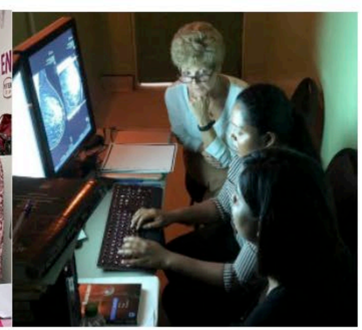
- densitas® intelliMammo™ deployed at GPHC, Aug. 2021
- onboarding of MITs, Oct/Nov 2021



Deploying A.I. @ GPHC

RAD-AID
Radiologists

GPHC
MITs



Methods

Deployment

An A.I. mammography quality platform (densitas® intelliMammo™), was introduced at GPHC in August 2021

5 MITs trained on software use

Data Collection

Post-adoption positioning error rates were assessed on 585 mammograms prospectively
(11/1/2021-4/15/2022)

Five common positioning errors (CC exaggeration, inadequate pectoralis muscle length, inframammary fold (IMF) missing, nipple not in profile and pectoralis muscle concave) were evaluated

Pre-adoption positioning error rates were assessed on 897 mammograms retrospectively
(8/1/2020-10/31/2021)

Analysis

A test of equal proportions was used to test the null hypothesis of equality of proportions for each positioning error prior to versus following adoption

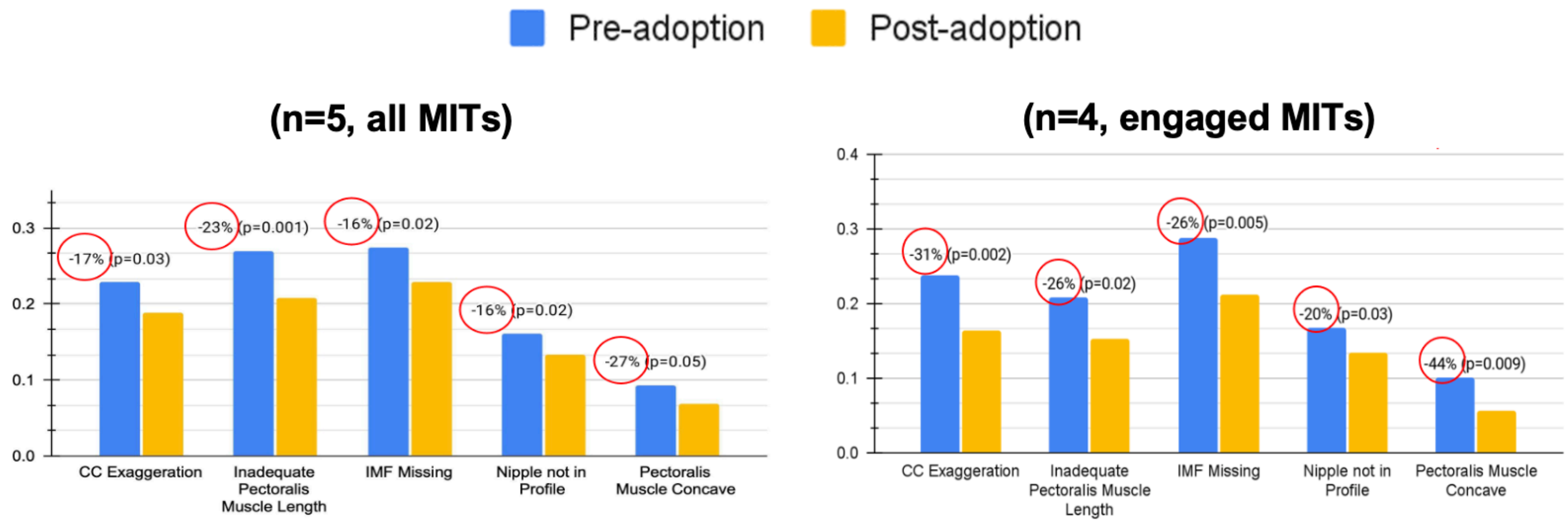
A test of equal proportions was used to test the null hypothesis of equality of proportions for each positioning error between engaged and unengaged MITs, stratified by pre/post adoption

Two RAD-AID radiologists were interviewed to understand quality improvement experiences, workflows and challenges pre/post software adoption.

Results – Interview with Radiologists

Prior to A.I. adoption	MITs infrequently communicated challenges with positioning and radiologists' feedback was subjective.
Post A.I. Adoption	**MIT–radiologist communication improved and A.I. quantitative results sparked development of educational positioning training videos to improve mammography image quality.**

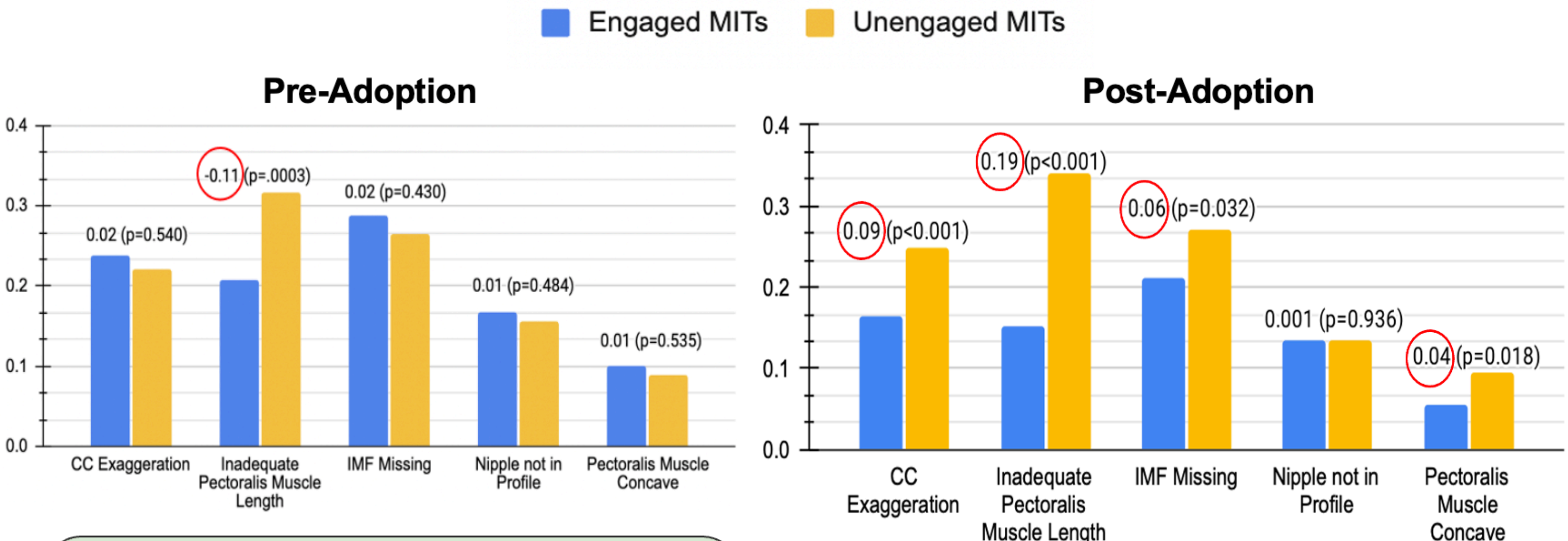
Pre vs. Post Adoption Positioning Error Rates



Each of the mammography positioning error rates **were statistically significantly different ($p<0.05$) pre/post-software adoption.**

The <u>improvement</u> in positioning error rates was markedly better for the MITs more actively utilizing AI (engaged).

Engaged vs. Unengaged Positioning Error Rates



Pre-adoption mammography positioning error rates were **statistically significantly different (p<0.05) for 1 of 5 positioning errors** for four MITs actively utilizing A.I. (engaged) compared to one that did not.

Post-adoption mammography positioning error rates were **statistically significant different (p<0.05) for 4 of 5 positioning errors** for four MITs utilizing A.I. (engaged) compared to one that did not.

Discussion

The **adoption of an A.I. tool for MG quality improvement** in a remote reading environment with international travel restrictions due to COVID pandemic curtailed on-site visits by RAD-AID radiologists **significantly reduced MG positioning error rates** in a LMIC and **enhanced MIT–Radiologist communications** to guide effective MG positioning training.

Greater engagement with the A.I. tool resulted in greater improvements in error rates.

The A.I. platform facilitated improved communication between radiologists working remotely and local MITs, with increased opportunities for mentoring and tutoring.

Study limitations:

1. Small sample size (n=5 MITs)
2. Observational study, not randomized controlled study

Conclusion

Artificial intelligence may have the potential to drive mammography image quality improvements by,

1. reducing mammography positioning error rates
2. enhancing MIT-radiologist communications to guide effective remote mammography positioning training

The next step is to conduct a multi-centre trial to evaluate the impact of such an A.I. tool in clinical practice.