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Breast Cancer Screening: Improved Readings With Computers

COMPUTER-AIDED DETECTION IN SCREENING MAMMOGRAPHY

You are listening to ReachMD XM 160, The Channel for Medical Professionals.

Welcome to Advances in Medical Imaging, a program discussing the latest innovation in clinical radiology and imaging technologies. The British and European approaches to mass-screening mammography relies on 2 readers per exam. Can one of the readers be a computer? I am Dr. Jason Birnholz, your host. With me today is professor, Fiona Gilbert, joining us from the Aberdeen Biomedical Imaging Center in Scotland. Dr. Gilbert is head of the institute and professor of Radiology at the University of Aberdeen.

DR. JASON BIRNHOLZ:

Dr. Gilbert thank you very much for your transatlantic presence.

DR. FIONA GILBERT:

It is my pleasure.

DR. JASON BIRNHOLZ:

Your recent article in The New England Journal involved some 68,000 women. Were these un-selected women, women with risk factor for breast cancer or specifically women without known risk factors?

DR. FIONA GILBERT:

So these are women from the GENO population between ages of 50 and 70, who are in anxiety for routine screening mammography. So they have no risk factors so just normal population that we screen in UK.

DR. JASON BIRNHOLZ:

Okay, is that different from that let say a woman who has a risk factor, is there some different protocol that she follows?

DR. FIONA GILBERT:

No, we do not actually routinely ask about risk factors when we are inviting women for screening in UK. In the UK, we invite all women between the ages of 50 and 70 to be screened every 3 years by 2-view mammography and we do not single out woman, who have say a family history or who have perhaps other risk factors. What we do to women who are known to be at very high risk of breast cancer had a slightly different living and regime where they have different frequency of mammography.

DR. JASON BIRNHOLZ:

Could you tell us why Britain has moved to a double reading standard?

DR. FIONA GILBERT:

In Scotland where I work we started of double reading at the beginning whom we started screening in 1988 and so the whole of Scotland was being screened by 1991 and we always had 2 radiologists reading the mammograms and England starts of doing single readings some of the states, but as evidence became available that a second reader could improve the cancer detection rate all by up 10%, England then moved to having 2 readers reading the films.

DR. JASON BIRNHOLZ:

While some of your readers were especially trained technologists. Weren't they?

DR. FIONA GILBERT:

That's right, in the UK we do not have this quite of many radiologist that you have in the states and so in order to address that very large workload that this screening program generates. We decided to encourage our radiographers or technicians to become experts in film readings of these people underwent intensive in training and also performance testing and they are allowed to read the mammogram along with a radiologist, so in the UK we have our post callers that radiologist and radiographer technician can read the mammogram.

DR. JASON BIRNHOLZ:

Well, did the technologist act in an adjunctive role or they experience as such they can really function alone?

DR. FIONA GILBERT:

We find that we have done a lot of testing along that and we find that in fact they can really perform as a standalone role. At the moment, we have not move to have 2 technicians reading the films only, we haven't yet made a final step, but were kind of heading in that

direction, but at the moment in the UK we have a radiologist and a technician or we have 2 radiologists or even a trained we called them breast clinicians again who are kind of highly trained experts in using mammograms so you don't have to be a radiologist there, but they can be a doctor, who has got a lot of experience in breast imaging and they can be the second person reading the film.

DR. JASON BIRNHOLZ:

Now, when you used the computer-aided detection, which is a way of highlighting parts of images I supposed to trying to do artificial intelligence interpretation, what did you find when you use this?

DR. FIONA GILBERT:

The system that we used is called computer-aided detection and is developed by an R2 Technology, which is now I think it is noticed to be Hologic and what it does is it is a software program, which picks up abnormal features in the mammogram, which might represent cancer and what we did we were interested to see whether one of our readers using the system could find as many cancers and as 2 readers and reading the films and so we were hugely interested in this because well it has lots of attractions, you know, computers don't go on holiday and they are never on maternity leave and they don't get tired and things and so their performance is pretty reproducible and robust while you are using them. So what we find was that we find that you know if one of our 2 readers was using the computer they could find as many cancers as if we had 2 readers. So this is a hugely interesting result for us and has some great implications for a screening program.

DR. JASON BIRNHOLZ:

Well, do you think that this was because there is a fatigue factor with human readers reading a lot of films per day or was it that the computer algorithm was looking at image features that were perhaps different from what the eye can perceive?

DR. FIONA GILBERT:

The performance of second read, the second read pick up an additional 10% and you have to ask the questions why is that the first reader isn't seeing those additional 10% of cancer and it may be that there are not tuned in to perhaps some of the characteristics of the second reader might be able to pick up on or it may be that as you say that may get fatigued while they are doing the reading or they may get distracted and you know there are number of reasons that people have suggested, that means the people overlook a particular signs or a feature on mammogram that represents the cancer and that is why having a second pair of eyes looking at the film has been shown to be so useful and I supposed the act of the computer drawing the reader's attention back to areas, which should be really examined carefully, we think that why the system work. It is not that the computer performing better than a reader can't. It is just a combination whereby the reader's attention is being, their eyes are being drawn to particular areas of the mammogram and they are being prompted, you know, to look again at particular area and that makes them or hopefully stops them missing that tends into cancers that they might otherwise have done.

DR. JASON BIRNHOLZ:

If you are just tuned in, you are listening to Advances in Medical Imaging from ReachMD, The Channel for Medical Professionals. I am Dr. Jason Birnholz and I am speaking with professor Fiona Gilbert. We are discussing computer-aided detection in screening mammography.

Well, here in the United States, there has been a real strong trend towards digital mammography or digital acquisition of mammograms, and I would think that the computer-aided detection schemes could be done with a mammogram itself right when the patient is still at the facility that might affect call back rates too. Do you think that this is a trend?

DR. FIONA GILBERT:

That is an interesting thought isn't it I supposed in an ideal world we would have a computer system, which could pre-read the films for us so you consider literally you know click the button and the prompts could come up and if there were no prompts if the mammogram had no prompts one is as told then you could send the woman away and say no your mammogram is fine and then you could have the reader come along and read those cases, which just had prompts on them. That would be an ideal world and the problem is that the computer systems are excellent for picking up calcification these tiny little flacks on the mammogram, which can represent cancer or a pre-cancerous stage, but the problem is that many of cancers appear as masses of soft tissue areas on the film and the algorithms aren't quite as good on detecting all the cancers. So they may be only pick up you know almost 90% of those, but they will miss 10% of cancers. So if we were to only relay on a CAD system you know during this initial pre-read for us we would have to accept that would be missing 10% of cancers. So it would be brilliant if we could get to a stage with the computer system could do this initial filter for us you know that would reduce our workload hugely, but I don't think we are quite there yet.

DR. JASON BIRNHOLZ:

Well, I mean the computer-aided detection scheme that you validated involved digitizing films and you got very very good result even introducing those extra steps, which can effect the image quality in a significant way, and I would just think if you were able to digitize things directly and not only would it be faster, but it probably would be better in some ways.

DR. FIONA GILBERT:

The companies have done quite a lot work comparing the results with taking the film mammograms and comparing it with digital images and the algorithms perform about the same level. The algorithms do not detect more of cancers from the digital acquired images compared to the films screened images so I do not think the performance of the software algorithm is better on digital system compared to screened film systems, so you are absolutely right it would be must more cost effective to use the CAD system when your are acquiring your mammogram digitally. It is much more practical way of using it.

DR. JASON BIRNHOLZ:

Let's speculate a little bit about the future in this way. I am sure algorithms will change, will be improved, will be other feature sets people will look at and at some point fairly soon will be an improvement there are always impact in recognition. It may take more computing, but there is early study progress in that area when you are dealing with complex images. What about the possibility of having a digital image that is done some facility and then as it is being done you tell the radiologist at some place in the world may be the Aberdeen the leading center where it is the process with a very best algorithm imaginable on some super computer and then zip directly back to the facility taking essentially no time right while the patient is there. Is that the way to introduce this kind of technology to a lot of small centers?

DR. FIONA GILBERT:

I think that is certainly a possibility and either you I can have this kind of distributed network as you are describing and you can have all the mammograms being read in a particular center with a particularly super duper software algorithm, but in some ways it is almost it is easy to put the algorithms on to the individual workstations because it is just a matter of copying the programs if you like them and putting the program on the individual workstations and you can either work in a network way and that would be fantastic to do that and then you can a reader in all over the world treating with these different systems, but I think what we do need to do and like you on very hopeful that that algorithms will continue to improve and also hopefully won't from algorithms as not only to pick up all the cancers, but we want them to also reduce the number of false prompts so that when you have loss of marks in mammogram, which are marking things which are note cancerous. Because these can be hugely distracting for a reader and when you end up using a CAD system with lots of prompts, then you end up really overcalling women and causing unnecessary anxiety and distress by calling them back for a workup when there is no cancer there in the first place. So there is a downside having lots of these prompts in the film that you have to be careful about it.

DR. JASON BIRNHOLZ:

Let's think about one other aspect that instead of making the most of mammograms, as they exist what about alternatives to convectional mammogram such as may be synthesize polytomography or MRI or some other modality used in a screening mode.

DR. FIONA GILBERT:

Yes, the tomosynthesis area I think is hugely interesting, the digital mammograms were we take basically lots of digital pictures of the breast and then we can look through them. We examine since taken at the same setting only a very slight increase in the radiation dose and this new technology, which is essentially a mammogram that lots of different slices taken through the breast is I think hugely interesting on its one of the areas we hope to do some work and I think it would in the results are very promising. As far as MRIs concerned this is a longer examination, it is hugely sensitive mucus probably one of the sensitive techniques would go for detecting early breast cancers and we started to use in UK for a woman, who are increased risk of breast cancer because of the family history.

DR. JASON BIRNHOLZ:

Thanks to professor Fiona Gilbert who has been our guest and we have been discussing computer-aided detection in screening mammography. I am Dr. Jason Birnholz, please visit our website at www.reachmd.com, which features our entire library through on-demand pod casts. Thank you for listening.

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