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Research finds three major failings in some apps used for the diagnosis of skin cancer

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In the scramble to bring successful apps for the diagnosis of skin cancer to market there is a concern that a lack of testing is risking public safety, according to research led by the University of Birmingham.

The research, outlined at the British Association of Dermatologists' Annual Meeting in Edinburgh, reviewed the medical literature on skin cancer apps to explore the number of apps on the market, ascertain how accurate they are, and what the benefits and limitations of these technological solutions are. Examples of apps include tele-dermatology (which involves sending an image directly to a dermatologist), photo storage (which can be used by individuals to compare photos monthly to look for changes in a mole), and risk calculation (based on colour and pattern recognition, or on fractal analysis).

The researchers found that some of these apps have a comparatively high success rate for the diagnosis of skin cancer. Teledermatology correctly identified 88 per cent of people with skin cancer and 97 per cent of those with benign lesions. Apps which use fractal theory analysis algorithms (detecting irregularities in a fractal pattern) were the next most successful category, these correctly identified 73 per cent of people with skin cancer and 83 per cent of people with benign lesions. These types of technology have huge potential, as 50 per cent of dermatology referrals in the UK relate to skin cancer. Early diagnosis results in up to 100 per cent five-year survival, compared with 25 per cent in women and 10 per cent in men diagnosed at a later stage. Technology that can help with triaging would help alleviate pressure on dermatology

departments and could also increase survival rates.

However, the researchers point to three major failings with some of the apps: a lack of rigorous published trials to show they work and are safe; a lack of input during the app development from specialists to identify which lesions are suspicious; and flaws in the technology used, namely how the photos are analysed.

The researchers explain that, without specialist input, the apps may not recognise rarer or unusual cancers. Even where the technology is efficient, if it has not been combined with specialist input from a dermatologist, it may not pick up on all red-flag symptoms.

In terms of technology, an area where colour and pattern recognition software apps seem to particularly struggle currently, is in recognising scaly, crusted, ulcerated areas or melanomas which do not produce pigment (amelanotic melanomas). This increases the number of false negatives and delays treatment.

Some apps that compare images on a monthly basis or 'advise' users to seek dermatologist review, based on a risk calculation, are not able to differentiate between finer details which would be identified using a dermatoscope (a magnifier that can be handheld or attached to a phone), or in person when touched by a dermatologist. If the app is based on advising patients whether to seek professional advice, then they may advise wrongly as they have not correctly identified finer details which may point to a more sinister lesion.

There are also certain criteria that an app cannot always register, for example if a person aged over 40 develops a new mole which has grown. In clinic this person would be advised that the mole should be removed, however, an app may not be able to provide such personalised advice.

Maria Charalambides, of the University of Birmingham's College of Medical and Dental Sciences, who conducted the literature review, said: "Future technology will play a huge part in skin cancer diagnosis.

"However, until adequate validation and regulation of apps is achieved, members of the public should be cautious when using such apps as they come with risk.

"Any software that claims to provide a diagnostic element must be subject to rigorous testing and ongoing monitoring.

"Apps specifically based on patient education of skin cancer can offer public health benefits in terms of how to stay safe in the sun, or the warning signs to look out for.

"But as per the British Association of Dermatologists recommendations, most apps cannot currently substitute dermatologist review when it comes to actual diagnosis."

Matthew Gass of the British Association of Dermatologists, said: "These new technologies for the diagnosis of skin cancer are exciting, but the varying quality available makes it a difficult landscape for people to navigate.

"These apps are not a replacement for an expert dermatologist, but they can be a useful tool in the early detection of skin cancer.

"We urge people who are thinking about using these apps to research how they work and to be cautious regardless of their recommendations.

"If a patch of skin such as a mole is changing in shape or size, not healing or just doesn't seem right, go and see your GP regardless of what any app tells you."

Skin cancer is the most common cancer in the UK and rates have been climbing since the 1960s. Every year over 230,000 new cases of non-melanoma skin cancer (NMSC) – the most common type – are diagnosed in the UK. In addition to NMSC, there are approximately 16,000 new cases of melanoma every year, resulting in around 2,285 UK deaths annually.

More information: Charalambides (et al). 'Use of dermatology apps: a cause for concern or the future of healthcare provision?' Unpublished abstract.

Abstract

In the U.K., 50% of dermatology referrals relate to skin cancer. Early diagnosis results in 100% 5-year survival, compared with 25% in women and 10% in men diagnosed at a later stage. With 6.3 billion smartphone subscriptions estimated to be in use by 2021, the field of telemedicine and specifically teledermatology has begun a period of evolving growth and there is now widespread availability of skin cancer-related dermatology apps. The aim of this review is to explore the range of apps available, evaluate the benefits and limitations of such apps and assess their role in the effectiveness of teledermatology. Search engines, including Pubmed and Medline, have been used to view the literature. A variety of apps are available for public download. The best method for melanoma diagnosis was those who sent the image directly to a dermatologist for analysis (88% sensitivity, 97% specificity). The second most effective apps (73% sensitivity and 83% specificity) use fractal theory analysis algorithms. In the U.K., the use of store-and-forward teledermatology has been proposed as a service delivery model to manage capacity demands. The benefits of teledermatology include education, encouragement of personal responsibility and provision of equitable services to remote areas. Teledermatology is an effective triaging tool, ensuring patients are seen in the most appropriate setting at first appointment via the 2-week-wait, alleviating NHS pressures. This

leads to timely treatment. Limitations include the lack of rigorous U.K. published trials supporting a safe, efficient service. There is a lack of validation, regulation, scientific and speciality input of apps. Currently, colour and pattern recognition software apps are unable to recognize scaly, crusted, ulcerated areas or amelanotic melanomas, increasing false negatives and delaying treatment. The experience of the teledermatologist influences the accuracy of apps and the possibility of user error in taking a quality photograph remains. As inferred by the BAD, teledermatology apps have benefits when integrated in care as a first step in early detection. Encryption of images and patient consent are essential. Concerns regarding accountability for inaccurate diagnoses made by apps should be addressed. Further U.K.-based research into efficacy and economic viability of teledermatology apps is required. According to NICE, patients with potential skin malignancy should be seen in person by specialists. Therefore, apps can currently supplement but not substitute standard medical care.

Provided by University of Birmingham