Skin Tags to DICOM Tags: Advancing Dermatology Imaging for AI Research

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Introduction:

- Smartphone use for image capture – this is quick and convenient for practitioners and patients.
- Standard challenges – this capturing process does not use the DICOM (Digital Imaging and Communications in Medicine) standard.[1] It is difficult make these images and their metadata safe and de-identified for research.[2]
- Enhancing AI research data safety – we have developed a pipeline to automatically process dermatology imaging into de-identified, research safe DICOM images.

Fig. 1 Dermatoscope with attachment for smartphone.[6]

Aim:

Two main objectives:

• Automatic DICOM conversion – develop a system for routine conversion from dermatology images and the associated metadata into DICOM files, in accordance with the dermatology DICOM standard.[3]

• Data de-identification for enhancing interoperability and safety – perform an extra automated processing on dermatology DICOMs to de-identify the images and their associated metadata, transforming them into safe, research-ready datasets.

Methods:

- DICOM standard mapping – the DICOM standard for dermatology was used to generate a mapping from existing patient imaging and associated clinical data to the DICOM format.[4][5]

DICOM Tag Name	DICOM Tag
Acquisition Context Sequence	(0040,0555)
Previous History of <condition>	(0008,0100)
Previous History of <condition> Total # Cases	(0040,A30A)
Family History of <condition>	(0008,0100)

Table 2: Template DICOM structure for mapping history of a skin condition

- Automated image conversion – then, tooling was developed to automatically convert existing and new dermatology imaging into the DICOM standard.
- SMI pipeline processing – these generated dermatology DICOMs were then processed using the SMI (Software for Medical Imaging) pipeline. This pipeline allows data analysts to run analysis, anonymisation and other processing techniques on DICOM images to prepare them for use in research.
- Manual review for anonymisation – after the DICOMs were processed, a final manual step to ensure that no identifiable images are present in the data is undertaken. These types of images can occur when practitioners capture too much of a face, tattoo or other identifiable marker. Once any identifiable images were flagged and removed, the data was made available for research.

Results:

- Volume processing – the dermatology DICOM pipeline successfully processed over 6000 images.
- Data integrity and safety – these DICOMS are standardised and research ready.
- Scalability and integration – the automated pipeline allows scalability and integration into broader dermatology imaging workflows into other health boards.

Impact:

Ensuring data security and compliance under facilitated collaboration, this is an advancement in medical imaging to foster AI diagnostic tool development. These images were successfully used by industry partners within a TRE (Trusted Research Environment) as part of an SBRI (Small Business Research Initiative) challenge.

Lessons Learned:

- DICOM standardisation – we have shown that dermatology imaging can safely and accurately be transformed into the DICOM standard.
- Automated processing – we have also shown that the automatic processing of these images can produce safe, de-identified datasets for research with minimal human oversight.
- Foundation for research platform – these results build the groundwork for a future dermatology imaging platform to allow large-scale dermatology imaging datasets to be used for medical research.

References:

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