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Digital Healthcare Transformation in Ophthalmology

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Digital healthcare transformation

Health information technology (HIT) is the application of software or hardware to assist in collecting, storing, or processing healthcare information. Digital health transformation (DHT) is an ongoing change process that applies HITs to facilitate healthcare access, diagnosis, management, and promotion.

DHT Evolution

Ophthalmology units have implemented HITs over the past 40 years, but there is considerable variation between departments in achieving DHT. While the UK Ophthalmology Alliance (UKOA) has previously published a practical Digital Maturity Assessment (DMA) tool, this is only for ophthalmic diagnostic imaging (ODI) rather than DHT on a broader scale[1]. As a result, there is minimal national data on DHT progression within ophthalmology in the UK.

Maya Angelou said, "If you don't know where you've come from, you don't know where you're going."

Table 1 is a general overview of DHT changes within ophthalmology. It is not detailed enough to act as a DMA tool and is not intended to be an exhaustive list of all DHT aspects. Readers will likely find their units straddle several phases.

Digital healthcare leadership

Any change process requires a leader to oversee and drive the entire journey to minimise any delays, disorder, and failure. This role becomes more complex particularly when planning a series of changes. A clear foresight of the final outcome and the ability to adjust plans as needed is crucial. This is a role for digital health leadership within DHT. However, the idea of a dedicated digital lead role is still not universally accepted or promoted.

How to do it

Recruitment should ideally be open to all grades and disciplines, with the role specification altered to focus on the following:

1. Digital health experience and qualifications
2. Information governance (IG)
3. Data security
4. Clinical safety of digital systems

It is sensible for applicants to hold a substantive post to minimise the risk of disruption of projects. Incorporating such a role into the job plan with appropriate remuneration is also vital.

Digital leads require support in their development by undertaking additional qualifications (such as the NHS Digital Academy PGDip or MSc in Digital Health Leadership) and attending digital health-related conferences for continuous professional development. Incorporation into unit governance processes is required to ensure involvement in all digital-related discussions and decisions. Further experience through attendance at wider trust digital health boards can be beneficial.

Basic roadmap

The following steps suggest what DHT units should explore if they have not already achieved them. The desire for change within a department and the ability to secure the necessary financial, information technology, and project management resources will dictate the pace and feasibility of change.

Phase	Period	Device development	Device data storage	Device data access	Patient records	Data structure	Referral pathways
Big Bang	1920s	Commercial fundus camera	None or on-device	On-device, printed, or dedicated application	Paper	Completely unstructured	Phone, paper, fax
	1960s	Automated perimetry, A-scan, B-scan					
	1970s	Specular microscopy					
	1990s	OCT, automated corneal topography, automated optical biometry					
Expansion	2000 to 2010	Ocular response analyser, iCare tonometer	As above, or a central physical server	As above, or PACS software	Almost all paper, some EPR use	Minimal structured	As above, NHSmail use increasing
Consolidation	2010 to 2020s	3D cameras for surgery	As above, or a central virtual server	Almost all use PACS software	Shift towards EPR use, paper minimal	Moderate structured	As above, NHSmail use commonplace, referral platforms appearing towards the end. Faxes phased out.
Refinement	2015 to present	Digitisation of previous analogue technologies	As above or cloud server	PACS software only	Complete EPR use	Almost all structured	Phone, referral platform use expanding, NHSmail use diminishing

Table 1: Overview of Digital Health Transformation within Ophthalmology.

Step 1 – Walking

The first step is making a unit completely paperless, from the patient record to prescriptions. The first significant milestone is unit-wide migration to an electronic patient record (EPR) solution. Failure to take the time to do this correctly usually results in a more extended optimisation phase. This stage is ideal for establishing minimum sub-speciality datasets (see below). Following EPR implementation, the residual paper in a unit usually consists of consent forms, day case pathways, referrals, and patient instructions on the day of an appointment.

E-consent solutions do exist and have been implemented successfully in the NHS. Some platforms can support remote consenting and integration with EPR systems. Digitisation of day case pathways is achievable within EPR packages, to develop a built-in form that directly captures data in a structured manner throughout the process. Ophthalmic EPR solutions can integrate with a patient administration system (PAS) and facilitate the assignment of pre-clinician instructions required per patient.

The second step is consolidating ODI infrastructure using digital imaging and communications in medicine (DICOM) compliant equipment and picture archiving and communication software (PACS)[2]. This facilitates access and storage of ODI results and integration with ophthalmic EPR solutions. Consolidation should aim to include PAS integration to facilitate modality worklists (MWL). MWL provides ODI devices with a list of upcoming patients to choose from, avoiding transcription errors and duplicate database entries.

Step 2 - Jogging

Dealing with referrals is the next step. The national eye care electronic referral system (EeRS) programme initiated by NHSX in 2020 was designed to facilitate referrals from primary care optometrists to secondary care by providing each NHS England region with central funding to procure a regional EeRS solution. Unfortunately, a national 'hands off' approach, coupled with COVID-19 and integrated care system reform challenges, has made EeRS implementation inconsistent and challenging across England. Where implemented successfully, EeRS is driving DHT further via the following streams:

1. Reorganisation of referral and booking pathways to eliminate manual and convoluted steps.
2. Transcribing e-copy of ophthalmic EPR letters to primary care optometry securely and consistently.
3. Empowering patients by facilitating access to eye care services for those on a patient-initiated follow-up pathway.
4. Consolidation of clinical triage and data collection by incorporating GP electronic referrals.
5. Streamlining referrals from other specialities.
6. Supporting referrals from other services such as the national diabetic eye screening programme (DESP) or local school vision screening programmes.

Step 3 – Running

Ensuring that as much data as possible within the EPR is in a structured rather than an unstructured format comes next. 'Structured data' refers to data captured and stored in a standardised and organised format that allows software and users to extract part or all of that data efficiently. Data that fails to meet this standard can be considered 'unstructured data' and includes free text. 'Data quality' refers to the data in a system being as complete and accurate as possible.

As outpatient clinics can be busy, clinical staff using EPR solutions may enter less than optimal data, often using the fastest method available. The result is poor data quality, in an unstructured fashion. When unstructured, it takes significantly longer to extract, organise and analyse data than if it was structured. This makes it challenging to undertake departmental audits, or develop services and workforce plans to match the needs of the local population. Analysis of poor-quality data can lead to reporting flawed conclusions, which can negatively impact decision-making and planning.

Furthermore, some NHS trusts receive commissioner funding through a 'payment by results' type system, where payment is based on the volume of work undertaken, with per-patient funding adjustments based on modifiers such as co-morbidities. When a unit fails to capture its work accurately, remuneration for a trust is less than it should be.

These issues gain intermittent attention when other DHTs are ongoing. Once Steps 1 and 2 are completed, and there is a greater expectation for high-quality structured data, this results in a more significant focus on the situation. Raising awareness about the consequences of sub-optimal or unstructured data is a good start. Such education would require repeating regularly due to intermittent workforce turnover. Audits focusing on data quality and appropriate structuring would assist the progress.

Ideally, there should be a minimum dataset within ophthalmic EPR solutions, which might help resolve data quality issues. The Royal College of Ophthalmologists (RCOphth) has published some clinical datasets[3], but these do not yet cover all sub-specialities. Furthermore, ophthalmic EPR suppliers do not offer the functionality to mandate such dataset compliance. Making it easier to enter structured data rapidly through improved user experience design while simultaneously phasing out unstructured data entry where possible would help reduce the risks of unstructured data.

Step 4 – Sprinting

Units merging ophthalmic EPR solutions and ODI databases to facilitate shared patient care across large geographic areas is no longer a pipe dream. However, compliance with legal requirements can make this challenging. While data sharing can occur to an extent earlier, the benefits are more limited unless the prior steps have been fully implemented. Data from multiple units ('big data') can be easily combined for research and audit purposes. Artificial intelligence (AI) can support comparison with other datasets (for example, health inequalities) to look for patterns as a novel approach and is also being applied to areas such as clinical decision support and patient communication.

Immediate steps

As units continue to move forward on their DHT journeys, it might be helpful for organisations like the RCOphth and the UKOA to consider the following actions to support this work:

1. Develop and publish a standardised role specification for a digital lead in ophthalmology, with guidance on minimum job planning requirements.
2. Develop and oversee a dedicated forum for UK digital health leaders within ophthalmology as with clinical leads.
3. Develop a broad DMA tool for benchmarking purposes and collect data regularly to inform national planning.
4. Develop a complete set of minimum requirement clinical datasets across all sub-specialities and request ophthalmic EPR suppliers to incorporate these and offer the ability to mandate compliance for improved data quality.
5. Encourage regular sessions at the RCOphth Annual Congress focused on DHT to facilitate communication and demonstration of ongoing work. Perhaps even a full day or half-day if sufficient topics.

References

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