DIGITAL TRANSFORMATION of the NHS, supported by programmes such as those set out in the NHS (2019) Long Term Plan, is vital for its long-term sustainability (Department of Health and Social Care (DHSC) 2022). Reaching the productivity ambitions detailed in the NHS Long Term Workforce Plan (NHS England 2023a) relies on the ‘widespread safe, effective and ethical adoption’ of digital and technical innovations, including digital tools such as electronic patient records (EPRs) (DHSC 2022). Effective digital transformation requires digital literacy, skills and leadership among the health and social care workforce (DHSC 2022); however, digital literacy among front-line health and social care staff is variable (NHS England 2023a).

There are various definitions of digital literacy. For example, digital literacy has been described as the ability to use technology effectively, access and evaluate information, connect with others and produce and share content, as well as making effective use of the internet and technologies to achieve academic and professional goals (Terry et al 2018). Digital literacy has also been described as ‘the capabilities which fit someone for living, learning, working, participating and thriving in a digital society’ (Health Education England (HEE) and Royal College of Nursing (RCN) 2017).
Historically, healthcare organisations and services have been slow to adopt new digital tools and technologies (HEE and RCN 2017). However, evidence suggests that having a digitally literate workforce can improve the adoption and use of technologies such as EPRs (HEE 2019, Männistö et al 2019, NHS England 2023a), while a digitally literate nursing workforce can enable the delivery of safe, effective care and improve patient outcomes (HEE 2017). The NHS Long Term Workforce Plan (NHS England 2023a) emphasises that the successful adoption of digital and technological innovations requires ‘transformation and skills development [and] upskilling and training staff’.

This article describes a model of education implemented at Imperial College Healthcare NHS Trust that uses data from the trust’s EPR system to identify nurses’ digital literacy training needs and delivers targeted strategies to meet those needs. The overall aim is to enhance digital literacy among nurses so as to improve their engagement in digital workflows and adherence to documentation standards. The article includes four case studies that illustrate improvements in documentation standards at Imperial College Healthcare NHS Trust following implementation of the education model.

Background
Imperial College Healthcare NHS Trust is largely paper free, in line with the Global Digital Exemplar programme (NHS England 2023b). The move from a paper-based system to an EPR has enabled automated data collection from large samples – including from all patient encounters and individual staff entries – which can be used to improve patient care and enhance efficiency (Bardsley et al 2019).

While the trust acknowledged the excellent care delivered in its inpatient settings, senior nurse leaders recognised that there was a gap in documentation in EPR digital workflows to evidence that care. To address this issue, the trust’s chief nurse information officer, in collaboration with the business intelligence team, developed three applications to generate data that could be used to identify nurses’ engagement in digital workflows and adherence to documentation standards (NHS England 2023c). In this context, applications are a way of collecting, analysing and displaying or visualising large sets of data.

The three applications – Harm Free Care, Digital Literacy and Positive Patient Identification – are:

» Linked to key nursing metrics, such as the completion of a core risk assessment within six hours of admission.
» Linked to barcode scanning in the trust’s electronic medicine administration system.
» Accessible to all senior nurses via a software programme used to collect and manage data.

Table 1 summarises the three applications. Data from the Digital Literacy application provided evidence that, while nurses were delivering high-quality care, their documentation of that care within the corresponding EPR workflow did not always follow the recommended approach or standard. Additionally, anecdotal evidence indicated that some ward nurses required support to engage with newly implemented digital workflows within the EPR system. Adherence to digital workflows is influenced by a range of factors, including digital literacy. The trust therefore decided to implement a data-driven education model to address digital skill gaps among nurses. This was facilitated by a newly established digital education team.

Role of digital education team
The trust’s newly established digital education team comprises three digital clinical practice educators (DCPEs), a new role developed by the trust’s chief nurse information officer and deputy chief nurse information officer. These three DCPEs are the first three authors of this article.

The trust has three main sites, 52 inpatient wards and approximately 4,300 registered nurses and midwives. To ensure the proposed education model would be effective and achievable, each DCPE was tasked with overseeing one of the trust’s three main sites. The proposal was that the DCPEs would, in collaboration with ward leaders and senior nurses, identify areas for improvement using the data from the three applications (Table 1), provide targeted education and training at ward or individual level, and monitor improvements. The DCPEs would also provide education and support to newly employed nurses who might not be familiar with the trust’s EPR system.

To support the DCPEs’ work, the trust’s director of nursing and its chief nurse information officer developed the following key performance indicators:

» Increase in percentage of core risk assessments completed within six hours of admission.
» Increase in Positive Patient Identification scan rate.

Key points
● The NHS emphasises that the successful adoption of digital innovations requires training and upskilling of staff
● Electronic patient records (EPRs) enable the automated collection of data which can inform strategies to improve patient care
● One NHS trust has implemented an education model that uses data from the EPR system to identify nurses’ digital literacy training needs
● At that trust, digital clinical practice educators deliver targeted educational strategies to improve nurses’ use of digital workflows
● Nurses at the trust are encouraged to engage in digital optimisation by questioning digital workflows and suggesting improvements
A crucial part of the DCPEs’ role was to develop positive relationships with ward leaders and front-line staff. Digital workflows evolve rapidly, so it is essential to obtain senior nurse engagement to be able to identify areas for improvement and deliver educational strategies effectively.

**Education and support for newly employed nurses**

All newly employed nurses attend the trust’s mandatory EPR training session, which is delivered by the information and communication technology (ICT) training team. This mandatory training session provides baseline knowledge of the EPR system on which the DCPEs can build as required, first through small-cohort sessions then through one-to-one learning in clinical practice areas.

**Small-cohort sessions**

Following the mandatory EPR training session, newly employed nurses attend a learning and assessment session delivered by the DCPEs, usually to groups of up to six nurses. The DCPEs use a mix of cognitive, kinaesthetic, andragogic and experiential learning theories to support knowledge acquisition through observing, doing, experimenting, questioning, problem-solving, and people learning individually and from each other. Applying these learning theories can support educators to understand the way in which students learn and can help them create an open and understanding classroom environment (Hughes and Quinn 2013).

The small size of cohorts contributes to create a safe learning environment in which nurses feel able to question the DCPEs and their peers and critically evaluate the content of the session. This in turn can help the DCPEs to establish nurses’ understanding of the content. At the end of the session, nurses identify their further development needs through self-assessment on a learning platform.

**One-to-one learning in clinical practice areas**

Between two and four weeks after the small-cohort session, the DCPEs meet newly employed nurses individually in their clinical environment to support a consolidation of their learning and its application to practice. The DCPEs coach nurses one to one at the bedside in real time. A DCPE and a nurse might work together to provide a care intervention, for example a skin assessment, after which the DCPE guides the nurse through the documentation of the care intervention in the relevant part of the EPR system.

Some newly employed nurses need several one-to-one sessions to adapt to the EPR system. Relating the digital workflows directly to an individual patient, under the guidance of a DCPE, supports nurses to understand why the completion of core risk assessments and accurate documentation in the correct workflow in the EPR system are vital to ensure safe and effective patient care.

**Education and support at ward and individual levels**

Beyond the training and support provided to newly employed nurses, the DCPEs review and analyse the data generated by the three applications to identify wards and individual nurses who require additional support and design tailored education and support. Wards and nurses regarded as digitally literate, evidenced by consistent and

<table>
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<th>Application</th>
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| Harm Free Care               | » Reports key nursing metrics related to patient harm across the trust, including the percentage of patients who have had core risk assessments - such as skin assessments and falls assessments - completed within six hours of admission  
» Metrics are extracted directly from the electronic patient record (EPR) system and reported on a month-by-month basis at ward, division and site levels |
| Digital Literacy             | » Analyses how many core risk assessments have been carried out within specified time frames by individual nurses, including temporary, specialist and agency nurses  
» Metrics are extracted directly from the EPR system and reported at individual nurse level |
| Positive Patient Identification | » Reports individual, ward, site and organisation adherence to one aspect of the trust’s electronic medicine administration system - that is, barcode scanning of the patient’s wristband and medicine when a medicine is administered to a patient  
» Involves using a barcode scanner to scan the patient’s wristband barcode and the medicine barcode to confirm the patient’s name, date of birth and hospital number and the medicine name, dose, route and formulation  
» Provides a digital safety check in addition to the ‘6 rights’ of medicine administration – that is, the right person, right medicine, right route, right dose, right time and person’s right to decline (National Institute for Health and Care Excellence 2017) |

Table I. Summary of the three applications used to identify nurses’ engagement in digital workflows and adherence to documentation standards
accurate documentation using the correct digital workflows, generally do not require additional support from the DCPEs but can contact them if needed, for example if a workflow is modified or if a new workflow is introduced.

Some wards and nurses only need signposting to additional resources to support and enhance their digital engagement. The DCPEs can provide various resources, for example quick reference guides comprising step-by-step instructions for commonly used digital workflows. There is also a digital nursing education resource page that can be accessed on the trust’s intranet or via a QR code, as well as a quarterly newsletter with a range of information such as links to online learning resources and updates on the digital education team’s work and on new developments in the EPR system.

Wards and nurses who require more comprehensive support, evidenced by inconsistent documentation identified via the applications, are offered a range of educational strategies. Examples of educational strategies used to resolve digital workflow issues are shown in Table 2.

**Harm Free Care application**
The DCPEs review the Harm Free Care application monthly to identify areas requiring improvement. When an area requiring improvement is identified, for example the number of falls risk assessments completed within six hours of admission on a particular ward, a DCPE works with the ward leader to explore which educational strategies to use to improve digital engagement.

**Digital Literacy application**
The DCPEs review the Digital Literacy application monthly to identify trends in individual nurses’ completion of core risk assessments over specific time frames – that is, the previous month, two to three months, four to six months and over six months. These data are used to explore individual nurses’ digital literacy, rather than their adherence to documentation standards. The DCPEs then provide targeted educational support to individual nurses to help them to use the correct workflows. Some nurses only need minimal support while others need several small-cohort and/or one-to-one coaching sessions until they reach an appropriate level of digital literacy.

**Positive Patient Identification application**
The DCPEs review the Positive Patient Identification application weekly to identify wards and individual nurses who may require support in the adoption and/or consistent use of the Positive Patient Identification digital workflow. Ward performance depends on several factors, for example issues with the barcode scanner, individual nurses’ competence in using the technology and temporary staff’s lack of familiarity with the technology. The effective use of the Positive Patient Identification application relies on multidisciplinary team (MDT) collaboration and on involving ward staff, ICT and pharmacy colleagues. The DCPEs therefore act as a link between staff to support ward leaders to problem-solve any hardware or barcode scanning issues. Additionally, the DCPEs work with ward staff to address gaps

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<th>Area identified as requiring improvement</th>
<th>Educational strategies</th>
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<td>Ward-level engagement with digital workflows</td>
<td>» Ward-based group training – the digital clinical practice educator (DCPE) can deliver training sessions to groups of nurses attending ward meetings or ward huddles</td>
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<td>» Bite-size training – the DCPE can deliver brief (5-10 minutes) ward-based teaching sessions to one or two nurses</td>
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<td>» Weekly ‘hot topics’ – the DCPE can collaborate with the ward leader to promote a specific area that requires improvement over the course of one week, for example during handovers</td>
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<td>» Handover visits – the DCPE can visit the ward during a handover to remind and encourage staff to attend to an area that has been identified as requiring improvement</td>
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<td>» Quality improvement – the DCPE can encourage ward nurses to undertake a quality improvement project related to the area identified as requiring improvement and offer coaching to support them</td>
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<tr>
<td>Individual-level engagement with digital workflows</td>
<td>» Development of an individualised training plan in collaboration with the individual nurse and ward leader</td>
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<td></td>
<td>» Small-cohort learning and assessment sessions</td>
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<td>» One-to-one coaching in clinical practice</td>
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in competence in using the equipment, for example by accompanying the nurse during a medicine round to identify and resolve issues in real time.

**Challenges and solutions**

A number of challenges were encountered during the implementation of the education model. Examples of challenges and solutions are shown in Table 3.

**Digital optimisation**

Digital optimisation has been described as a continuous process which improves the usability and functionality of an EPR system over time and can involve adding or removing features from the system (NHS Providers 2023). It is important that nurses are involved in digital optimisation (Agnew 2022).

The education model developed at Imperial College Healthcare NHS Trust facilitates nurses’ involvement in digital optimisation through the development of a trusting relationship between the DCPEs and nurses. This trusting relationship enables nurses to question, and suggest changes to, digital workflows in the EPR system, which the DCPEs can feed back to the deputy chief nurse information officer. This creates a line of communication between front-line nurses and senior nurse leaders. The DCPEs believe that this digital empowerment of nurses supports shared governance and is essential to the development of a safe and efficient EPR system (Jaber et al 2022).

The DCPEs use the three applications to evidence improvements in digital engagement by individual nurses and wards. The four case studies (Case studies 1-4) provide examples of improvements. For example, Case study 4 illustrates the way in which feedback from nurses has led to changes to EPR workflows resulting in increased digital engagement.

The effectiveness of the education and training delivered by the DCPEs is continually evaluated by monitoring data trends in the three applications, by obtaining qualitative anonymised online feedback from individual nurses who have attended training sessions, and by obtaining informal feedback from individual nurses and ward leaders. New key performance indicators are being developed for the DCPEs that will focus on other areas of digital engagement in which wards and individual nurses may require education and support, and a new application is being developed to support the delivery of the new key performance indicators. In addition, a ward digital nurse champion network is being established within the trust to enhance the progress made in nurses’ digital engagement and digital literacy.

**Conclusion**

Digital literacy among nurses is essential to support the digital transformation of the NHS and enhance patient care and patient safety. To improve nurses’ digital literacy and digital engagement, one NHS trust has implemented a data-driven education model delivered by a team of DCPEs. In collaboration with nurse leaders, the DCPEs identify areas for improvement at ward and individual level using data generated by three applications linked to the EPR system, and deliver targeted educational strategies off and on the ward. Improvements in nurses’ digital engagement have been evidenced by data analytics. This education model also engages nurses in the optimisation of the EPR system by supporting them to question digital workflows and suggest improvements.

<table>
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<tr>
<th>Challenge</th>
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<th>Solution</th>
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<tr>
<td>Hardware issues</td>
<td>When the scanners for the Positive Patient Identification application did not work, it affected nurses’ ability to engage in that digital workflow and prevented the digital clinical practice educators (DCPEs) from providing coaching</td>
<td>The DCPEs escalated this issue to information and communication technology leads at the trust and a reporting channel was established to prioritise replacing or fixing equipment that was vital for the effective use of the Positive Patient Identification application</td>
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<tr>
<td>Resistance to change</td>
<td>Since digital workflows evolve rapidly, nurses and ward leaders could become overwhelmed by the frequent need to adapt to changes in the electronic patient record (EPR) system. This was sometimes expressed through a reluctance to engage in new digital workflows</td>
<td>The DCPEs worked to identify the cause of any apparent reluctance to engage in new digital workflows. It emerged that this could be due to a lack of confidence or knowledge gaps. The DCPEs ensured nurses and ward leaders were provided with a clear and evidenced explanation of the benefits of any changes to the EPR system. Lack of confidence and knowledge gaps were addressed through targeted education and support in clinical practice</td>
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Case study 1. Small-cohort sessions

Newly employed nurses, and nurses identified as requiring support with digital workflow engagement, attend small-cohort sessions with a DCPE. One example of improvement following small-cohort sessions was an increase in the percentage of nurses completing the elements of core risk assessments on a monthly basis, as measured by the Digital Literacy application.

At the time of writing, the aim was for 70% of nurses to complete each element of core risk assessments over one month. That time period had been selected because all nurses are encompassed in the data, including bank or agency staff who may not be familiar with the trust’s digital workflows and specialist nurses for whom risk assessments may not be a central or familiar element of their role.

Small-cohort sessions started in July 2022. By March 2023, the 70% target had been reached or exceeded for two elements of core risk assessments (falls and bed rails) while there had been a continuous increase in the percentages of nurses completing Body Map digital forms and measuring Waterlow scores (Figure 1).

![Digital Literacy application](image1)

Case study 2. Bite-size training

Data extracted from the Harm Free Care application enabled the DCPEs to identify that, on one ward, daily skin assessments were not being completed using the recommended Body Map digital form. The assessments were being recorded as unstructured data – that is, as free-text comments rather than as structured data within the required field in the EPR system (NHS England 2023c).

In July 2022, one of the DCPEs began delivering bite-size training to staff on that ward on using the correct Body Map workflow. By August 2022, the ward’s engagement with the digital Body Map workflow had increased from 0% to 97% and a high level of digital engagement with that workflow was sustained during the subsequent year (Figure 2).

![Harm Free Care application](image2)
Case study 3. One-to-one coaching and education

Data from the Positive Patient Identification application enabled the DCPEs to identify low engagement with a newly installed Positive Patient Identification workflow that was being piloted at one of the trust’s sites. The DCPE for that site identified that nurses felt that Positive Patient Identification checks were not required in addition to the ‘6 rights’ of medicine administration (listed in Table 1) (NICE 2017) and increased the length of time required to administer medicines to patients. In addition, there were hardware issues – specifically unreliable scanners.

The DCPE addressed the hardware issues first (as described in Table 3), since consistent practice could not be achieved without functioning equipment, then delivered one-to-one coaching and education across the site on a ward-by-ward basis. This gave nurses the opportunity to question the rationale for the new Positive Patient Identification workflow and to better understand how it would reduce the risk of errors. Following implementation of this strategy, medicine scan rates on that site increased from 21% in August 2022 to 72% in July 2023 (Figure 3). The DCPE has supported ongoing adherence to the workflow by visiting the wards during handovers and medicine rounds to identify, discuss and resolve outstanding issues in collaboration with staff. Improvements in adherence have been recognised through an awards scheme for most improved ward and individual nurse.

Case study 4. Digital optimisation

The DCPEs received feedback from some nurses that the elements of core risk assessments for patients at the point of admission were not easy to find on the EPR system and that the digital workflows required were not obvious. The DCPEs shared that information with the senior digital nursing team, who designed and implemented a new format in collaboration with the trust’s transformation team. This part of the digital workflow is now in a ‘booklet’ format which collates all the elements of core risk assessments for patients on admission.

The new format was introduced into the EPR system in October 2022 and its rollout in ward areas was supported by the DCPEs, ward educators and ward leaders. The effectiveness of this digital optimisation is illustrated by the adherence to the bed rails risk assessment (Figure 1), which is one of the elements of core risk assessments on admission. Before implementation of the new format, adherence to the bed rails risk assessment had been around 4% in August 2022 (October 2022) and increased the length of time required to administer medicines to patients at the point of admission. In addition, there were hardware issues – specifically unreliable scanners.

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Figure 3. Positive Patient Identification application

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References