

Digital literacy: standards and framework mapping



A report produced by True Blue Sky Social Enterprise Ltd

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Foreword

This paper is one of six undertaken by the Digital Literacy Project as part of its scoping and review work of the current landscape, in terms of digital literacy in the UK.

The Digital Literacy Project concerns itself with the ability of all within healthcare to become, and to remain, digitally literate. This is so that all are able to learn, work and develop effectively in a digital workplace and society. The project aims to promote the adoption of clear education, training and development strategies that will enable this and which will also promote and support the adoption and spread of new technologies and techniques.

The Technology Enhanced Learning (TEL) Programme was established in 2013 with the vision that healthcare in the UK be underpinned by world-class education and training that is enhanced through innovation and the use of existing and emergent technologies and techniques. The Programme has a wide remit and has a number of ongoing projects, one of which is the Digital Literacy Project.

Health Education England (HEE) is the national body formed in 2012 to undertake leadership and co-ordination of education and training within both the health and public health workforce. This includes workforce development, planning and evolution in line with key changes, including the impact of technological advances. HEE is responsible for delivering a better health and social care workforce for England. It is the organisation responsible for the education, training and personal development of every member of staff and for recruiting for values.

Executive Summary

The NHS Health Education England (HEE) Technology Enhanced Learning (TEL) Programme definition for digital literacies is:

“those capabilities which fit someone for living, learning, working, participating and thriving in a digital society.

Digital literacy is person-centred and can be divided into six domains. Each one has its own capabilities and behaviours to help improve the health and social care workforce.

- 1. Communication, collaboration and participation*
- 2. Teaching, learning and self-development*
- 3. Information, data and media literacies*
- 4. Creation, innovation, scholarship*
- 5. Technical proficiency*

Underpinning all the above domains is the sixth - digital identity, wellbeing, safety and security.” (NHS HEE, 2017)

A capability framework for digital literacy is now being developed, and to support this work, this desktop study aims to answer the following key question:

To what extent and in what ways do existing standards and frameworks align with the Health Education England digital literacy definition and domains?

through addressing the following subsidiary questions:

- What digital literacy standards, capabilities, skills, attitudes and behaviours currently required of different groups, professions, individuals within the health and social care workforce?
- What existing digital literacy standards and frameworks are there and what are their key characteristics?
- How far do existing standards and frameworks map to the Health Education England digital literacy definition and domains?

Methodology

A search of a wide range of databases, National Occupational Standards (NOS); Professional and Regulatory Bodies (PRB) standards, and guidance; Higher Education benchmarks and apprenticeship standards was conducted. Initially, the date limitation was 3 years, however, owing to the small number of frameworks/standards located the date

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limitations for the search was extended to 10 years in order to capture relevant professional frameworks. The search of academic journals was restricted to the last 3 years, although a seminal paper from 2001 was included.

A total of 21 competency frameworks/ standards that are specifically focused on digital literacy capabilities were located. Six were developed for the UK health and social care workforce and 8 were international, with the majority focusing on nursing. Five UK and 2 international frameworks/ standards from other sectors were also identified. A further 96 (80 UK and 16 international) health and social care and relevant other sector, standards guidance and frameworks that included a specific mention to some aspect of digital literacy (however briefly) were also located. The selected sources were then reviewed and any relevant capabilities, standards, guidance, etc., mapped against the HEE Digital Literacies domains.

Findings

The mapping revealed that the primary digital literacy requirement for the health and social care workforce is focused on *Information, Data and Media Literacies*. The *Communication, Collaboration and Participation* domain is the next largest area identified from the mapping. It is suggested that this is owing to the number of informatics focused sources reviewed.

The *Technical Proficiencies* domain was also strongly identified across the sources mapped and included a broad range of skills from very basic to highly specialised. One approach to addressing this in the HEE digital literacy capabilities framework may be to cluster these skills according to task or purpose. In the *Digital Identity* domain, there was a strong emphasis on IT systems security, particularly technical aspects; information governance, data protection and confidentiality, as well as personal online safety.

The *Teaching, Learning and Self-Development* and the *Creation, Innovation, Scholarship* domains were less likely to be reflected in the mapped frameworks. Capabilities related to the *Teaching, Learning and Self-Development* domain appear only occasionally in frameworks dated 2001 – 2011 after which it is featured more frequently.

Capabilities that map against the *Creation, Innovation, Scholarship* domain have been consistently included in frameworks and standards since 2001. Capabilities in this domain refer to a range of digital capabilities including coding, the use and reuse of digital content and the use of social media.

Definitions of digital literacy, where included in the sources identified, were often quite broad focusing on high level skills such as managing data/information, using technology, etc. Elements of the HEE definition could be seen in all the definitions, but the closest match was with the definition offered by the Open University (2012):

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“Digital literacy includes the ability to find and use information (otherwise known as information literacy) but goes beyond this to encompass communication, collaboration and teamwork, social awareness in the digital environment, understanding of e-safety and creation of new information. Both digital and information literacy are underpinned by critical thinking and evaluation.”

The characteristics of the frameworks, etc., reviewed varied considerably in size and structure, with one framework having over 1000 competency statements. The National Audit Office (NAO) (2015) identified that digital skills frameworks were considered by the workforce and organisations to be too large, inflexible and complex. Therefore, the challenge for HEE is to develop a framework that is fit for purpose and accessible to all staff in the health and social care workforce.

Two areas were identified that will require particular consideration by HEE when developing the digital competency framework:

- Digital literacy and leadership
- Ethics and responsibility.

In terms of digital leadership, some of the frameworks reviewed included leadership elements, such as the ‘*E Health Competency Framework: Defining the Role of the Expert Clinician*’ (Academy of Medical Royal Colleges, 2011). Mapping any leadership capabilities proved challenging as there did not always seem to be a “best-fit”. Therefore, as digital capabilities are developed, the knowledge, skills and attitudes required by leaders should be differentiated and reflect the drive for leadership at every level in both health and social care.

Ethics and social responsibility in relation to digital literacy was highlighted by several authors and is explicitly referred to in the 2017 QAA Benchmark Statement for Social Work:

“understanding the social impact of technology, including the constraints of confidentiality and an awareness of the impact of the ‘digital divide’.”

Ferrari (2012) contends that in relation to digital literacy, ethics and responsibility:

“...is understood as the knowledge, attitudes and skills needed to behave in an ethical and responsible way, aware of legal frames.” (p44)

Thus, ethics and social responsibility can perhaps be best represented through attitudinal and behavioural capabilities for digital literacy.

For both digital leadership and ethics and social responsibility however, there is a need to ensure that they are explicitly highlighted throughout all the domains within the framework.

Conclusion

Digital literacy capabilities, standards and frameworks that are available significantly map successfully across the HEE Digital Literacy definition and domains. Integrating digital leadership and ethics and across all domains are two potential areas that will need particular consideration by HEE when developing a capabilities framework for digital literacy.

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1. Introduction

The NHS Health Education England (HEE) Technology Enhanced Learning (TEL) Programme digital literacy project aims to improve the digital capabilities of the whole health and social care workforce. A key output from the project has been the development of a definition for digital literacies:

“those capabilities which fit someone for living, learning, working, participating and thriving in a digital society.

Digital literacy is person-centred and can be divided into six domains. Each one has its own capabilities and behaviours to help improve the health and social care workforce.

- 1. Communication, collaboration and participation*
- 2. Teaching, learning and self-development*
- 3. Information, data and media literacies*
- 4. Creation, innovation, scholarship*
- 5. Technical proficiency*

Underpinning all the above domains is the sixth - digital identity, wellbeing, safety and security.” (NHS HEE, 2017)

A capabilities framework for digital literacy is now being developed and to support this work, TrueBlueSky Social Enterprise Ltd was commissioned by HEE to undertake a desktop study to answer the following key question:

To what extent and in what ways do existing standards and frameworks align with the Health Education England digital literacy definition and domains?

through addressing the following subsidiary questions:

- What digital literacy standards, capabilities, skills, attitudes and behaviours currently required of different groups, professions, individuals within the health and social care workforce?
- What existing digital literacy standards and frameworks are there and what are their key characteristics?
- How far do existing standards and frameworks map to the Health Education England digital literacy definition and domains?

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This review builds on previous reports looking at digital literacy definitions (Kennedy & Scott, 2016); a literature review on the extent to which digital literacy is seen as a challenge for trainers, learners and employees in the workplace (de Normanville & Scott, 2016) and a review to examine to what extent, and in what ways, employers and organisations are meeting the challenge of improving the digital literacy of their workforce (de Normanville, Scott & Speake, 2016). Findings from these previous studies and other preliminary work carried out by HEE TEL indicated that there were no existing digital literacy capabilities frameworks that could be adopted for the health and social care workforce.

2. Methodology

A search of a wide range of databases (including grey literature databases) and search engines, such as Google and Google Scholar, was undertaken using search terms that reflect the multiplicity of terms used to describe digital literacies (de Normanville & Scott, 2016) (see appendix 1). The scope included strategic and policy documents, website information and journalism, proprietary research and academic journals. Initially, the date limitation was 3 years, however, owing to the small number of frameworks/standards located, the date limitations for the search was extended to 10 years in order to capture relevant professional frameworks such as the UK Council for Health Informatics Professions (UKCHIP) (2009) framework. Searches for academic journals were restricted to the last 3 years, although a seminal paper from 2001 (Staggers, Gassert, & Curran) was included.

A total of 21 competency frameworks/ standards that are specifically focused on digital literacy capabilities were located. Five were aimed at the UK health and social care workforce (2 for social care, 1 for doctors, 1 general and 1 for Health Informaticians). Three international examples, 2 of which were focused on nursing were located. A further 5 UK and 2 international frameworks/ standards from other sectors were also identified. From the academic literature, 6 (1 UK and 5 international) health related frameworks were located, 3 of which again focused on nursing.

An extensive search was made of National Occupational Standards (NOS); Professional and Regulatory Bodies (PRB) standards, and guidance; Higher Education benchmarks and apprenticeship standards to identify any further capabilities/standards, etc., for digital literacy capabilities that have been included within them. Again the date limitation was extended to capture items that are still current (e.g., QAA Benchmark Standards and NOS).

This yielded 12 (11 UK and 1 international) health and social care specific standards, guidance or curricula that were strongly related to digital literacies and 16 (15 UK and 1 international) from other sectors. A further 68 UK health and social care workforce specific standards, guidance and frameworks, which included a specific mention to some aspect of digital literacy (however briefly) were also included.

The selected sources were then reviewed and any capabilities, standards, guidance, etc., were mapped against the HEE digital literacy domains (appendices 2 and 3). For the majority of sources, only partial mapping was conducted owing to areas of the capabilities / standards/guidance being outside the scope of Digital Literacy, e.g., capabilities related to financial management; interpersonal skills, clinical procedures, etc.. Moreover, for the sake of brevity, mapping for all sources was only recorded to the level of detail necessary for clarity.

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None of the sources identified have been subjected to synthesis or a quality appraisal as a) this review is being conducted as a scoping review rather than a systematic review and b) owing to the limited number of substantial sources in this area.

3. What digital literacy standards, capabilities, skills, attitudes and behaviours currently required of different groups, professions, individuals within the health and social care workforce?

The mapping revealed that the primary digital literacy requirement for the health and social care workforce is focused on *Information, Data and Media Literacies*. This finding is not unsurprising owing to the number of nursing related sources, whereby the term 'Informatics' seems to have been adopted as the primary articulation of digital literacy. Honey and Procter (2017) describe the history of nursing informatics in terms of moving from learning basic computer skills in the early 1990s, then in the late 1990s emphasising developing knowledge about information management. With increased connectivity, collaboration and communication have now come to the fore, and this emphasis can be seen in the number of sources mapped to the *Communication, Collaboration and Participation* domain whereby half of the sources from 2014 onwards are nursing related.

The next most common area of capability is *Digital Identity, wellbeing, safety and security*. Whilst personal online safety is identified, there is a strong emphasis on IT systems security, particularly technical aspects, information governance, data protection and confidentiality.

The *Technical Proficiencies* domain was also strongly identified across the sources mapped. The need to develop technical IT skills reflects the national and international emphasis on increasing the digital literacy of citizens (See European Commission, 2014). The capabilities identified range from the very basic through to highly specialised technical skills. For example, capabilities identified in the UKCHIP standards (2009) identify specialist IT system skills such as "*Interoperability and Integration*". At the other end of the scale, Skills for Care and Development basic digital literacy capabilities include "*the way that IT and other eAT devices are powered and the importance of powering/ recharging them*" (p11).

Maneschijn, Botha, and van Biljon (2013, p3) addressed this broad range by clustering technical ICT skills as follows:

- "*Basic skills*", e.g., generalised tasks, such as knowing how to switch on a PC etc.
- "*Productivity packages*", e.g., using proprietary software such as Microsoft Word to increase productivity
- "*Internet*", e.g., using search engines, social media, e-mail, messaging apps, etc.
- "*Digital Media*", e.g., creating digital media such as audio, videos, etc.

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- “*Specialisation*”, e.g., system management, coding, html, app development, etc.

Ferrari (2012) cautions though, that too much emphasis on technical proficiencies means that there is a failure to acknowledge the importance of other domains

The *Teaching, Learning and Self-Development* and *Creation, Innovation, Scholarship* domains were less likely to be reflected in the mapped frameworks. Both domains are evident in Staggers, Gassert, & Curran’s 2001 framework. For example:

“123. Projects health care computing trends in nursing...”

128. Discusses concepts and uses of robotics”

“250. Disseminates new knowledge by informing colleagues of new developments and applications in nursing or health care informatics.

251. Contributes to informatics education of students, peers and colleagues”

(Staggers, Gassert, & Curran, 2001, pp. 312, 315)

However, the *Teaching, Learning and Self-Development* domain is then absent from the mapped sources until 2004, and then only briefly mentioned in the Quality Assurance Agency (QAA) subject benchmark statement for Clinical Sciences:

“appreciate the importance of awareness of emerging technologies and new developments” (QAA 2004, p7)

It is again absent from the mapped sources until 2011 where it is included in the Academy of Medical Royal Colleges ‘E Health Competency Framework: Defining the Role of the Expert Clinician’. In this framework, both self-development, *“Keep up to date with eHealth related issues relevant to delivery of future services”* (p14) and developing others, *“Understand the need for all healthcare staff to be IT literate and able to use all aspects of eHealth safely, effectively and efficiently”* (p23) are addressed.

Subsequently, *Teaching, Learning and Self-Development* features in the General Medical Council (GMC) 2015 ‘Promoting excellence: standards for medical education and training’, highlighting the importance of *“access to technology enhanced and simulation based learning opportunities”* (p14) for learners. The most recent reference is in the Skills for Care (2016) ‘Core digital skills in social care’ framework that focuses on the practical skills required to access online learning. For example, *“access mobile learning via a tablet or smart phone”* (p13). It could be argued that this relates to *Technical Proficiency*, highlighting a significant challenge with the mapping in that that a number of capabilities identified could

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be mapped to more than one domain. The pragmatic decision was therefore taken to map against the 'best-fit' domain.

Capabilities related to the *Creation, Innovation, Scholarship* domain have been consistently evident in frameworks and standards since 2001. Capabilities in this domain refer to a range of digital capabilities from coding and the use and reuse of digital content through to the use of social media. In recent years guidance has been issued by the Nursing & Midwifery Council (NMC) and the GMC regarding appropriate use of social media.

In summary, there is a broad range of digital literacy standards, capabilities, skills, attitudes and behaviours articulated for the health and social care workforce. The challenge is that there are few dedicated frameworks or standards that provide a complete overview. Internationally, work is being undertaken through the EU*US eHealthWork Project (HIMSS, 2016), including the development of the HITCOMP Tool and Repository (Blake & Kaye, 2015, HITCOMP, 2017). However, as discussed below, the emphasis of this work is on the use of information technology rather than the broader capabilities for digital literacy.

4. What existing digital literacy frameworks are there and what are their key characteristics?

This section will briefly describe digital literacy frameworks, standards and capabilities related to the health and social care workforce. A selection of other sector frameworks are reviewed at appendix 4.

4.1. UK Health and Social Care Competence Frameworks

4.1.1. UKCHIP Standards for Registration (UK Council for Health Informatics Professions, 2009)

The UK Council for Health Informatics Professions (UKCHIP) was established as a voluntary regulatory body for Health Informaticians. The UKCHIP framework consists of 48 generic standards and specialised standards. These are further divided into professional and informatics standards. Each standard has a competency expectation articulated for each of the 3 levels of registration offered by UKCHIP. As well as ICT proficiencies, the framework covers professional behaviours and leadership and management.

At the beginning of 2017 UKCHIP closed and the standards setting role for informaticians was taken on by a new body, the Federation for Informatics Professionals in Health and Care (Fed-IP). Fed-IP is an umbrella organisation formed by the partnership of several professional bodies that have health and care informaticians among their members. (These are currently the British Computer Society (BCS), The Institute of Health Records and Information Management (IHRIM), CILIP the Library and Information Association, and SOCITM the Society for IT Professionals in the Public Sector.) Fed-IP are in the process of developing their standards, which will then be mapped back to the standards for each of the constituent organisations.

In addition, a new Faculty for Clinical Informatics has been established that will develop professional standards for clinical informaticians who are registered with a PRB (Faculty of Clinical Informatics, 2017)

4.1.2. E Health Competency Framework: Defining the Role of the Expert Clinician (Academy of Medical Royal Colleges, 2011)

The framework was developed to support clinicians who have an ehealth leadership role or who would describe themselves as “clinical informatician” (p10). It consists of 24 capabilities divided across 7 sections covering leadership and management; IT project management; clinical information; health records; IT systems; knowledge management and clinical coding. Each competence has objectives and articulates the knowledge, skills and behaviours required to meet the objectives.

4.1.3. Telehealthcare Competency Framework for Health and Social Care Professionals. Final Draft (Barry & Henderson, 2011)

This framework is aimed at professional health and social care staff, a previous framework for support staff having been developed in 2008. The framework consists of 6 domains with associated functions/tasks and capabilities. There is a mandatory set of capabilities for all health and social care staff and separate ones for technical staff supporting telehealthcare; professionals, supporting telehealthcare at home or in acute settings and senior strategic and operational managers. To an extent, the framework assumes that staff have basic digital literacy capabilities and it is focused more on the assessment and use of telehealth equipment and the associated service requirements.

4.1.4. Knowledge and Skills Sets to Embed Electronic Assistive Technology (eAT) In Social Care (Skills for Care and Development, 2014)

Aimed at the social care workforce, this framework consists of 18 capabilities with associated knowledge and skills needs grouped under 6 key-area headings. The knowledge and skills are described as task focused rather than role focused to enhance flexibility. There are no levels within the framework, and it primarily describes capabilities for the assessment, sourcing and safe use of electronic assistive technology equipment. There is a capability called “digital literacy” that in the main looks at how to use handheld devices, including how to recharge them, and how to safely access the internet. Capabilities related to human rights, and team working are also included.

4.1.5. Core digital skills in social care (Skills for Care, 2016)

This framework is aimed at the adult social care workforce and identifies the core digital “skills and knowledge needed to undertake everyday digital activities relevant to your job role” (p4). The framework consists of a 4 domain model with example core digital skills, tasks for organisations and a rationale. There is no indication of levels of skills or knowledge required.

4.2. International Health and Social Care Competence Frameworks/Standards

4.2.1. Informatics Capabilities for Every Practicing Nurse: Recommendations from the TIGER Collaborative (The TIGER Initiative, 2014)

This framework focuses on nursing informatics capabilities. It was developed as part of the EU/USA Technology Informatics Guiding Education Reform (TIGER) Initiative that broadly aims to improve patient care through the use of health information. The framework was developed from a literature review and the resulting 32 capabilities are divided into 3

categories: Basic Computer Capabilities; Information Literacy and Information Management.

The capabilities included in each category have been drawn from the ECDL (ECDL Foundation) the American Library Association's Information Literacy Competency Standards (www.ala.org) and Health Level Seven (HL7) Clinical Care Components (www.hl7.org).

4.2.2 Quality and safety education for nurses (Quality and Safety Education for Nurses (QSEN) Institute, 2014)

This framework is a more generic framework covering a range of issues for nursing. It includes a section on Informatics and issues of Digital identity, wellbeing, safety and security are considered under the Safety section. Capabilities are divided into knowledge, skills and attitudes.

4.2.3. National Informatics Standards for Nurses and Midwives (Australian Nursing and Midwifery Federation, 2015)

These standards again focus on nursing informatics. There are 10 standards divided across 3 domains; Computer Literacy (Standard 1); Information Literacy (Standards 2-4) and Information Management (Standards 5-10). Each standard is supported by 'cues', i.e., "key generic examples of competent performance" (p2).

The standards were developed to address the then gap in the Nursing and Midwifery Board of Australia's (NMBA) national standards for registered nurses and midwives and were to be incorporated into the revised practice standards issued by the NMBA. This inclusion aimed to ensure that informatics competence development will be embedded into nursing and midwifery education programmes.

4.2.4 The HITCOMP Tool and Repository (HITCOMP 2017)

The HITCOMP framework is the result of a collaboration between the EU and the US Office of the National Coordinator of Health Information Technology (ONC-HIT). The online searchable framework comprises 1,039 capabilities:

"...in five domains – Direct Patient Care, Administration, Informatics, Engineering/IS/ICT and Research/Biomedicine. Capabilities are associated with a particular level of skill (Baseline, Basic, Intermediate, Advanced and Expert). Capabilities are also mapped to over 250 health IT-impacted roles in Acute Care in each of the five domains." (HITCOMP, 2017)

Capabilities describe "observable and measurable abilities, skills and attributes".

The 268 roles identified cover clinical and non-clinical roles, and are differentiated by level of authority and level of expertise required. Additionally they are mapped across 4 service categories, ancillary; engineering/ICT/IS; nursing and physician/provider/medical staff. Although the framework covers a range of roles including direct patient contact roles, the emphasis in the framework is on health informatics and strategic implementation, systems management, procurement and maintenance. An education component is currently being developed. Owing to the size and complexity of the HITCOMP Tool, mapping has been carried out by area of competency, with example capabilities to illustrate relevance to the HEE domains.

4.3. Health Related Digital Capabilities in the Literature

4.3.1. Informatics Capabilities for nurses at four levels of practice (Staggers, Gassert, & Curran, 2001)

This seminal paper is focused on nursing informatics capabilities. It was developed through a literature review and expert panel process and identifies 304 capabilities across 4 levels of practice from “beginner to innovator” (p307). The capabilities are divided across 3 areas, Computer Skills; Informatics Knowledge and Informatics Skills. The framework maps fully across all 6 HEE domains.

4.3.2. Scoping the potential for a core capability framework for using technology to support improvement and transformation of health and social services (SMCI Associates, 2014)

This proprietary research report for NHS Education for Scotland aimed to scope the capabilities required for technology enabled learning. As with this review, the report found what it described as ‘paucity’ of available literature in this area. Based on its review, the report proposes a framework of core capabilities including: Learning capabilities for the digital age (described as the underpinning domain); Using technology to share information for integrated person-centred care; Using technology to support shared decision-making and self-management; Delivering care and support through telehealth and telecare technologies including assistive technologies and Using technology in leadership and innovation. The capabilities are accompanied by suggested knowledge skills and attitudes.

4.3.3. Preparing for the data revolution: identifying minimum health information capabilities among the health workforce (Whittaker, Hodge, Mares, & Rodney, 2015)

Using a Delphi approach, this paper identifies general health information skills required by the whole health workforce. Sixty-eight capabilities are identified across 4 levels and include capabilities on leadership and managing health information at a system level.

4.3.4 Refining a self-assessment of informatics competency scale using Mokken scaling analysis (Yoon, Shaffer, & Bakken, 2015)

This paper describes a study to refine the Self-Assessment of Nursing Informatics Competencies Scale (SANICS) to reduce it from a 93 item scale to an 18 item hierarchical scale that allows differentiation between novice and expert healthcare workers. The 18 items cover interprofessional informatics skills and general ICT skills.

4.3.5. Capabilities required for nursing telehealth activities: A Delphi-study (van Houwelingen, Moerman, Ettema, Kort, & ten Cate, 2016)

This paper focuses on telehealth capabilities for nurses. Using a Delphi approach, 14 “nursing telehealth entrustable professional activities (NT-EPAs)” (p50) with 52 associated capabilities were identified as being essential for telehealth. A number of the NT-EPAs identified relate to the provision of nursing care per se, and are not specific to telehealth, for example: “Monitoring body functions and lifestyle” and “Providing psychosocial support” (p54), but the authors contend that such generic skills are equally important for telehealth as they are for any other nursing practice.

4.3.6 Nursing Informatics Competency Assessment for the Nurse Leader: Instrument Refinement, Validation, and Psychometric Analysis (Yen, Phillips, Kennedy, & Collins, 2017)

This recent study focuses on validating nursing informatics capabilities for nurse leaders. Twenty-six capabilities were identified across 6 factors: strategic implementation management; advanced information management and education; executive planning; ethical and legal concepts; information systems concepts and requirements and system selection.

4.4 Other Health and Social Care Guidance, Standards and Related Curricula

Owing to the limited number of frameworks identified, it was decided to review a broader range of frameworks, standards and guidance. As Traver, Konstantinidis, and Bamidis (2015) observed:

“As far as we know, there is no specific resource which identifies the IT skills for healthcare workforce, but there are numerous resources that include IT skills among the general skills that different proficiencies of healthcare workforce should have.” (p562, emphasis added)

4.4.1. Professional and Regulatory Body Standards

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Within all the PRB standards reviewed, there was some reference to knowledge, skills and behaviours related to digital literacy. Education providers standards generally contain a requirement to include IT, informatics or technology enhanced learning (NMC, 2001, 2009, 2010 and 2017a; HCPC, 2014 and GMC, 2016a).

Standards for pre-registration training for Nurses and Midwives currently refer to the use of electronic records and IT systems as do the 'Standards for Registered Nurses and Midwives' (NMC, 2014a, 2014b). The NMC is currently consulting on the standards for education framework for approved education institutions (AEIs) (NMC 2017a); the requirements for pre-registration nursing education programmes (NMC 2017b) and revised standards of proficiency for registered nurses (NMC 2017c).

The education framework includes the requirement for students to be "...enabled to learn using a range of methods, including technology-enhanced and simulation-based learning..." (p13). However, there are no further references to digital literacy in the draft standards or draft programme requirements. One of the consultation questions for the latter suggests that AEIs will be able "to set entry criteria for literacy, numeracy and digital literacy and we [NMC] will not set requirements in this area." (NMC 2017d, p20).

The draft standards of proficiency for registered nurses (NMC 2017c) require, at the point of registration, that registered nurses will:

"Maintain the literacy, digital literacy and numeracy skills required to ensure their safe and effective nursing practice" (p9)

In addition nurses are required to use 'digital technologies' (p16) to communicate and to analyse and share information and data.

The formal public consultation runs from June to September 2017 with the revised outcomes expected to be approved in early 2018.

The RCGP General Practice Foundation (2012) capabilities for practice nurses include basic IT skills and information literacy skills. The GMC Standards for Graduates (2015) makes reference to health informatics and information governance, and there is increasing reference to digital literacy in the new generic professional capabilities (GPC) (GMC, 2016b). The GMC is working with the Royal Colleges to embed the GPC into post graduate curricula and this can already be seen in the 2016 CPD curricula from the Royal College of Obstetricians and Gynaecologists and the Royal College of Radiologists.

The Health Professions Council (HCPC) standards of proficiency (2013-2017), also contain references to digital literacy capabilities, although the primary emphasis is on Technical Proficiency.

4.4.2. Professional and Regulatory Body Guidance

In the last 5 years, the Royal College of Nursing (RCN), the GMC and NMC have brought out guidance reflecting the increasing digitisation of care. All 3 have developed guidance on the use of social media (RCN, 2014, GMC, 2013, NMC, 2015, NMC 2016, GMC, 2016); with the RCN also providing guidance on the content of ehealth records, perhaps reflecting the informatics focus in the profession (RCN, 2012). There is a strong emphasis in this guidance on digital identity, wellbeing, safety and security.

The NHS HEE Care Navigation Framework (2016) includes capabilities for communication and information and data and was also included in the mapping.

The NMC have recently published guidance on 'Enabling Professionalism' (NMC 2017e), that refers to the need to be technically competent to 'preserve safety' (p3) and providing access to technology equipment and shared data (p4). As with other guidance such as the District Nursing and General Practice Nursing Service Education and Career Framework (NHS Health Education England, 2015) there was insufficient detail or specificity to map this guidance against the HEE Digital Literacies domains.

4.4.3. National Occupational Standards

A total of 33 relevant National Occupational Standards (NOS) (National Occupational Standards, 2009-2015) were reviewed to identify digital capabilities. The NOS from the Tech Partnership were included as they are identified as related NOS for a number of roles in the UK Health Informatics Career Framework (HICF) (Velindre NHS Trust, 2015).

4.4.4. Further and Higher Education Standards

Relevant apprenticeship standards (Institute for Apprenticeships, 2014 - 2017) that have been approved for delivery or are in development were also reviewed and mapped. Only 7 were found to make any specific substantial reference to digital capabilities. The new degree nursing apprenticeship standard does make a brief reference to the use of technology, but there is no specific reference to digital literacy or informatics.

The Quality Assurance Agency (QAA) subject benchmarks for health and social care courses (QAA, 2017) date from 2001. Common to the majority of the 2001 benchmarks was the requirement that

"The award holder should be able to demonstrate an ability to engage with technology, particularly the effective and efficient use of information and communication technology"

There are also various references in individual benchmarks to the use of IT and computer skills. The 2016 Health Studies benchmark makes explicit reference to digital literacy, requiring students to:

“use information and communications technology to enhance digital capability and digital literacy in a variety of contexts”

4.4.5 Employability Skills Matrix for the Health Sector (Skills for Health, 2013)

The Employability Skills Matrix has been designed to articulate the key employability skills required by each of the 9 levels in the NHS Careers Framework (Skills for Health, 2010). “Use of IT” is included within “Skills in communication, mathematics and use of information technology (IT)”.

4.4.6. Digital Curricula

4.4.6.1 Systems of eCare

Since 2009, Sheffield Hallam University (Procter, 2017) have been offering all pre-registration AHP and Nursing students the opportunity to complete an e-learning module ‘Systems of eCare’. Focused on informatics, the students complete a unit each semester across the 3 years of their programme. The module is voluntary; however Procter reports that it is completed by over 70% of students each year. The units in the module introduce students to a range of issues including:

“information exchange, big data and population health, coding and classification, interoperability, information mapping, information intelligence, telematics, pharmacogenomics, nano-technologies and robotics in health care” (p360)

Procter also reports that the module has had the added benefit of increasing academic staffs’ confidence in including informatics in their teaching.

4.4.6.2 Embedding Informatics in Clinical Education (eICE)

eICE has been developed by NHS Connecting for Health and provides a programme of online learning resources for health information management (NHS Connecting for Health, 2017). An educational framework for health informatics underpins the programme (eICE, 2012). This informatics focused framework covers 7 themes: Protection of Individuals and Organisations; Data, Information and Knowledge; Communication and Information Transfer; Health and Care Records; The Language of Health: Clinical Coding and Terminology; Clinical Systems and Applications and eHealth: the Future Direction of Clinical Care. Learning outcomes are articulated against educational levels. The eICE programme is currently being reviewed and may be ended in 2017.

4.4.6.3 Informed - On online introduction to the use of informatics in healthcare

Developed by the Department of Health and hosted by 'e-learning for Healthcare' (e-lfh), the course draws on the UKCHIP framework looking at topics not covered by eICE. There are 5 standalone modules: Introduction to health informatics; Introduction to health and care; Improving the quality and safety of care through health informatics; The management and funding of health and care services and Primary and secondary uses of data in health and care (e-learning for healthcare, 2013).

4.4.6.4 The NHS IT Pathway

The NHS IT Pathway (NHS, 2011) offers IT skills programmes covering a range of basic IT skills and common Microsoft software programmes. It has replaced the ECDL programme in the NHS (Embedding Informatics in Clinical Education (eICE), 2012).

4.4.7 The Knowledge and Skills Framework (Agenda for Change Project Team, 2004)

The KSF was considered but not mapped. This is owing to there not being any explicit reference to digital capabilities, although Core Dimension 1 covers communication in general. However, NHS Scotland's guidance on this highlights the use of email and recording information on computer systems.

Overall, the frameworks, standards, guidance and curricula mapped have a variety of structures, and varying approaches to articulating levels of proficiency, from hierarchical to being differentiated within an individual competence. Some frameworks provide a very high level overview of competence areas, whilst others broke down competency statements into detailed descriptors of knowledge, skills and attitudes. The National Audit Office (NAO) Digital Skills Survey (2015) noted that respondents found digital skills frameworks inflexible, too large, complex and poorly matched to job roles.

5. How far do existing standards and frameworks map to the Health Education England digital literacy definition and domains?

Where available, definitions of digital literacy were compared across frameworks (appendix 5). This comparison reinforced the findings from the literature review (de Normanville & Scott, 2016) and desktop review (de Normanville, Scott, & Speake, 2016) that there is a multiplicity of terms and definitions of digital literacy. The definitions were often quite broad focusing on high level skills such as managing data/information, using technology, etc. Elements of the HEE definition could be seen in all the definitions, but the closest match was that of the Open University (2012):

“Digital literacy includes the ability to find and use information (otherwise known as information literacy) but goes beyond this to encompass communication, collaboration and teamwork, social awareness in the digital environment, understanding of e-safety and creation of new information. Both digital and information literacy are underpinned by critical thinking and evaluation.”

This definition encompasses all the HEE TEL domains with the exception of *Teaching, learning and self-development*.

Table 1 summarises the extent to which existing standards and frameworks map to the HEE digital literacy definition and domains (see appendices 2 and 3 for detailed mapping). Overall the existing standards and framework map comprehensively across the HEE domains. Two areas that may require particular consideration when developing the digital competency framework are:

- Digital literacy and leadership
- Ethics and responsibility.

In terms of digital leadership, Malloch and Mazurek Melnyk (2013) highlight the need for nursing leaders to develop “...*leadership competencies that integrate the digital realities of time, space, and media*.” (p60). Yen, Phillips, Kennedy, and Collins (2017) suggest that nurse leaders need to develop sufficient knowledge and understanding of the technical aspects of health information so they are:

“prepared to bring, and not delegate, digital competencies to interprofessional initiatives because they create optimal and supportive environments of care.” (p277)

Digital literacy: standards and frameworks mapping

Some of the frameworks reviewed included leadership elements, e.g., ‘SIFA v6’ (SFIA Foundation, 2015) and the ‘E Health Competency Framework: Defining the Role of the Expert Clinician’ (Academy of Medical Royal Colleges, 2011). Mapping any leadership capabilities identified proved challenging as there did not always seem to be a “best-fit”. To address this, as digital capabilities are developed, the knowledge, skills and attitudes required by leaders should be differentiated across all domains. Ferrari (2012) suggests that:

“...levels should not be crosscutting the competence areas, but should be differentiated. This is to say that levels might vary between competence areas and that any learner should be allowed and encouraged to work at different levels according to each competence area.” (p44)

This differentiated approach would ensure that digital leadership capabilities reflect the drive for leadership at every level in both health and social care.

Ethics and social responsibility in relation to digital literacy was highlighted by several authors. Maneschijn, Botha, & van Biljon (2013) suggest that ethics and social impact covers responsible use of the internet and “...evaluation of the impact of ICT in social, economic and cultural contexts.” (p3). This latter point is reflected in the 2017 QAA Benchmark Statement for Social Work:

“understanding the social impact of technology, including the constraints of confidentiality and an awareness of the impact of the 'digital divide'.”

Ferrari (2012) contends that in relation to digital literacy, ethics and responsibility:

“...is understood as the knowledge, attitudes and skills needed to behave in an ethical and responsible way, aware of legal frames.” (p44)

Thus, ethics and social responsibility can perhaps be best represented through attitudinal and behavioural capabilities for digital literacy.

For both digital leadership and ethics and social responsibility there is a need to ensure that they are explicitly highlighted throughout the domains within the HEE digital literacy capabilities framework.

Table 1: Summary Mapping of Frameworks/Standards/Guidance/Curricula against the HEE TEL Digital Literacy Domains¹

1. Communication, collaboration and participation	2. Teaching, learning and self-development	3. Technical proficiency	4. Information, data and media literacies	5. Creation, innovation, scholarship	6. Digital identity, wellbeing, safety and security
Staggers, Gassert, & Curran (2001)	Staggers, Gassert, & Curran (2001)	QAA Benchmark Statements (2001-2017)	Staggers, Gassert, & Curran (2001)	Staggers, Gassert, & Curran (2001)	Staggers, Gassert, & Curran (2001)
QAA Benchmark Statements (2001-2017)	QAA Benchmark Statements (2001-2017)	Nursing and Midwifery Council Standards (2001-2014)	QAA Benchmark Statements (2001-2017)	UKCHIP Standards for Registration (UKCHIP, 2009)	QAA Benchmark Statements (2001-2017)
<i>European Computer Driving Licence (ECDL Foundation, 2007 - 2015)</i>	E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011)	<i>European Computer Driving Licence (ECDL Foundation, 2007 - 2015)</i>	Nursing and Midwifery Council Standards (2001-2014)	National Occupational Standards (2009-2015)	<i>European Computer Driving Licence (ECDL Foundation, 2007 - 2015)</i>
Nursing and Midwifery Council Standards (2001-2014)	Telehealthcare Competency Framework for Health and Social Care Professionals (Barry & Henderson, 2011)	UKCHIP Standards for Registration (UKCHIP, 2009)	<i>European Computer Driving Licence (ECDL Foundation, 2007 - 2015)</i>	Systems of eCare (Sheffield Hallam University, 2009-2017)	UKCHIP Standards for Registration (UKCHIP, 2009)
UKCHIP Standards for Registration (UKCHIP, 2009)		National Occupational Standards (2009-2015)	UKCHIP Standards for Registration (UKCHIP, 2009)	E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011)	National Occupational Standards (2009-2015)
National Occupational Standards (2009-2015)	<i>Digital and information literacy framework (OU, 2012)</i>	E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011)	National Occupational Standards (2009-2015)	General Practice Nurse Competencies (RCGP 2012)	Systems of eCare (Sheffield Hallam University, 2009-2017)
Systems of eCare (Sheffield Hallam University, 2009-2017)	<i>European e-Competence Framework (European Committee for Standardization, 2013)</i>	IT Skills Pathway (NHS 2011)	Systems of eCare (Sheffield Hallam University, 2009-2017)	<i>European e-Competence Framework (European Committee for Standardization, 2013)</i>	E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011)
E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011)	HPCPC Standards (2013-2017)	General Practice Nurse Competencies (RCGP 2012)	E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011)	Doctors' use of social media: Guidance (GMC, 2013)	Telehealthcare Competency Framework for Health and Social Care Professionals (Barry & Henderson, 2011)
Telehealthcare Competency Framework for Health and Social Care Professionals (Barry & Henderson, 2011)	Quality and safety education for nurses (QSEN, 2014)	Learning to Manage Health Information: a theme for clinical education 2012. Making a difference. (eICE, 2012)	General Practice Nurse Competencies (RCGP 2012)	SMCI Associates (2014)	
IT Skills Pathway (NHS 2011)	SMCI Associates (2014)	HPCPC Standards (2013-2017)	Nursing content of eHealth records (RCN, 2012)	Apprenticeship Standards (2015-2016)	Learning to Manage Health Information: a theme for clinical education 2012. Making a difference. (eICE, 2012)
	<i>Basic Digital Skills framework (Go ON UK, 2015)</i>				Nursing content of eHealth

¹ Items in italics indicate sources that are not specific to the health and social care workforce

Digital Literacy: Competency Mapping Desktop Review

1. Communication, collaboration and participation	2. Teaching, learning and self-development	3. Technical proficiency	4. Information, data and media literacies	5. Creation, innovation, scholarship	6. Digital identity, wellbeing, safety and security
Nursing content of eHealth records (RCN, 2012) Learning to Manage Health Information: a theme for clinical education 2012. Making a difference. (eICE, 2012) <i>Digital and information literacy framework</i> (OU, 2012) Informed - On online introduction to the use of informatics in healthcare (e-Ith 2013) HCPC Standards (2013-2017) SMCI Associates (2014) Informatics Competencies for Every Practicing Nurse: Recommendations from the TIGER Collaborative (2014) Quality and safety education for nurses (QSEN, 2014) Yoon, Shaffer, & Bakken (2015) <i>Basic Digital Skills framework</i> (Go ON UK, 2015) Apprenticeship Standards (2015-2016)	Whittaker, Hodge, Mares, & Rodney (2015) Yoon, Shaffer, & Bakken (2015) GMC Standards (2015-2016) Core Module 3: Information Technology, Clinical governance and Research (RCOG, 2016) Core digital skills in social care (Skills for Care, 2016) <i>Digital and Technology Skills Matrix V. 1.0</i> (Cabinet Office, 2016) <i>Skills Framework for the Information Age version 6</i> (SIFA, 2016) <i>DIGCOMP 2.0</i> (Vuorikari, Punie, Carretero, & Van den Brande, 2016) Yen, Phillips, Kennedy, & Collins (2017) HITCOMP (2017)	<i>European e-Competence Framework</i> (European Committee for Standardization, 2013) Employability Skills Matrix for the Health Sector (Skills for Health 2013) Knowledge and Skills Sets to Embed Electronic Assistive Technology (eAT) in Social Care (Skills for Care and Development, 2014) Use of digital technology Guidance for nursing staff working with children and young people (RCN, 2014) SMCI Associates (2014) Informatics Competencies for Every Practicing Nurse: Recommendations from the TIGER Collaborative (2014) <i>Basic Digital Skills framework</i> (Go ON UK, 2015) National Informatics Standards for Nurses and Midwives (Australian Nursing and Midwifery Federation, Federal Office, 2015) Whittaker, Hodge, Mares, & Rodney (2015) Yoon, Shaffer, & Bakken (2015)	Learning to Manage Health Information: a theme for clinical education 2012. Making a difference. (eICE, 2012) <i>Digital and information literacy framework</i> (OU, 2012) Informed - On online introduction to the use of informatics in healthcare (e-Ith 2013) <i>European e-Competence Framework</i> (European Committee for Standardization, 2013) HCPC Standards (2013-2017) SMCI Associates (2014) Informatics Competencies for Every Practicing Nurse: Recommendations from the TIGER Collaborative (2014) Knowledge and Skills Sets to Embed Electronic Assistive Technology (eAT) in Social Care (Skills for Care and Development, 2014) Quality and safety education for nurses (QSEN, 2014)	<i>Basic Digital Skills framework</i> (Go ON UK, 2015) Core Module 3: Information Technology, Clinical governance and Research (RCOG, 2016) Public Health Skills & Knowledge Framework (PHE, 2016) <i>Basic Digital Skills Standards</i> (Draft for Consultation) (The Tech Partnership, 2016) <i>Digital and Technology Skills Matrix V. 1.0</i> (Cabinet Office, 2016) <i>Skills Framework for the Information Age version 6</i> (SIFA, 2016) <i>DIGCOMP 2.0</i> (Vuorikari, Punie, Carretero, & Van den Brande, 2016) Guidance on using social media responsibly (NMC, 2016) Yen, Phillips, Kennedy, & Collins (2017) HITCOMP (2017)	records (RCN, 2012) Doctors' use of social media: Guidance (GMC, 2013) Informed - On online introduction to the use of informatics in healthcare (e-Ith 2013) <i>European e-Competence Framework</i> (European Committee for Standardization, 2013) Employability Skills Matrix for the Health Sector (Skills for Health 2013) HCPC Standards (2013-2017) Informatics Competencies for Every Practicing Nurse: Recommendations from the TIGER Collaborative (2014) Quality and safety education for nurses (QSEN, 2014) Knowledge and Skills Sets to Embed Electronic Assistive Technology (eAT) in Social Care. (Skills for Care and Development, 2014) Use of digital technology Guidance for nursing staff working with children and young people (RCN, 2014) SMCI Associates (2014)

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6. Conclusion

The study has identified standards and frameworks that articulate and describe the range of digital literacy standards, capabilities, skills, attitudes and behaviours required of different groups, professions, individuals within the health and social care workforce. With many of these capabilities being either implicitly or explicitly included as items within other frameworks or standards it is challenging for organisations and individuals to assess existing digital literacy capabilities and identify skills gaps.

The frameworks that are available tend to have an informatics focus rather than articulating the broad range of digital literacies required. Moreover, areas around *Teaching, learning and self-development* and *Creation, innovation, scholarship* are underdeveloped.

The capabilities and standards that are available map successfully across the HEE Digital Literacy definition and domains. Integrating digital leadership and ethics and responsibility across all domains are two potential areas that may need particular consideration by HEE when developing a capability framework for digital literacy.

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Appendix 1: Search Strategy

Based on the previous literature review (de Normanville & Scott, 2016) and desktop review (de Normanville, Scott, & Speake, 2016) search terms were organised into 4 groups:

- | | |
|----------|--|
| Group 1: | Digital, eskills, e-skills, Technology, computer, IT, ICT, informatic*, telehealth*, ehealth, e-health |
| Group 2: | Capabilit*, fluency, competenc*, skill*, knowledge, attitude*, behaviour*, literac*, confidence |
| Group 3: | Framework*, standard*, guidance, statement* |
| Group 4: | Health* social care, NHS |

These terms were combined into search terms and strings and used to search the following databases: Cinhal; MEDLINE; Proquest and Google, and Google Scholar.

Inclusion and Exclusion Criteria

- Publication years: 2000 – 2017
- Language: English language only
- Abstract available
- Human adults 19+
- Higher education only if related to health and social care courses

Where duplicated content articles were identified, the most recent version was used.

Where searches identified high numbers of potential papers, these were filtered for relevance and only the first 200 hits examined.

A total of 4,318 articles, frameworks and standards were identified from the database and search engines. Forty-four were shortlisted with 28 selected for further review. The majority of sources were obtained through hand searching PRB, Sector Skills council, NOS & other professional websites. Snowball searching was also conducted, including, asking subject experts for suggestions of relevant sources and reviewing reference lists in shortlisted journal articles.

Appendix 2: Summary of Mapped Sources

Title	Date	Author(s)	Type	Sector	Country
QAA Benchmark Statements) Health Visiting (2001) Dietetics (2001) Nursing (2001) Podiatry (2001) Midwifery (2001) Occupational Therapy (2001) Orthoptics (2001) Physiotherapy (2001) Radiography (2001) Prosthetics and Orthotics (2001) Dentistry (2002) Medicine (2002) Clinical Sciences (2004) Operating department practice (2004) Arts Therapy (2004) Dental care professions (2005) Audiology (2006) Counselling and psychotherapy (2013) Optometry (2015) Paramedic Science (2015) Social Work (2016) Health Studies (2016) Psychology (2016)	2001- 2016	The Quality Assurance Agency for Higher Education	Standards	Higher Education	UK
Informatics competencies for nurses at four levels of practice	2001	Staggers, Gassert, & Curran	Research Article	Health - Nursing	USA
Nursing & Midwifery Council Standards and Guidance: Standards for specialist education and practice (2001) Standards for pre-registration midwifery education (2009) Standards for pre-registration nursing education (2010) Standards for competence for registered nurses (2014) Standards for competence for Midwives (2014) The Code (2015)	2001 - 2016	Nursing and Midwifery Council	Standards	Health - Nursing	UK

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Title	Date	Author(s)	Type	Sector	Country
Guidance on using social media responsibly (2016)					
European Computer Driving Licence	2007 - 2015	ECDL Foundation	Curricula	General	Europe
Systems of eCare	2009 - 2017	Sheffield Hallam University	Curricula	Higher Education	UK
UKCHIP Standards for Registration	2009	UK Council for Health Informatics Professions	Framework	Health – Informatics	UK
National Occupational Standards: CFASAA231 Use IT to support your role (2009) SFHGEN31 Initiate, and participate in, networks and discussion groups (2010) SFHGEN32 Search information, evidence and knowledge resources and communicate the results (2010) SFHH115 Develop a specification for systems that meet the needs of staff, patients and the public for health information (n.d.) SFHH119 Search for clinical information and evidence according to an accepted methodology (2010) SFHSS08: Support the use of information technology (2010) SFHSS33 Enter, retrieve and print data in a database (2010) ESKITU010 Source digital information (2015) ESKITU011 Organise digital information (2015) ESKITU012 Interpret digital information (2015) ESKITU013 Develop digital information strategies (2015) ESKITU020 Use digital communications (2015) ESKITU021 Select and configure a range of digital communications media (2015) ESKITU022 Manage digital communications using a range of media (2015) ESKITU030 Participate in online networks and social media (2015) ESKITU031 Select and use collaborative IT tools and social networks (2015) ESKITU032 Moderate the use of collaborative IT tools and social networks (2015) ESKITU033 Manage collaborative IT tools and social media	2009 - 2015	The Tech Partnership (Prefix: EKSTU) Skills for Health (Prefix: SFH) SKILLS CFA (Prefix: CFA)	Standards	IT, Health and Social Care	UK

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Title	Date	Author(s)	Type	Sector	Country
(2015) ESKITU040 Use safe and secure practices when working with digital systems (2015) ESKITU041 Set up security software for digital systems (2015) ESKITU042 Implement security procedures for digital systems (2015) ESKITU050 Use digital systems (2015) ESKITU051 Configure digital systems (2015) ESKITU052 Optimise performance of digital systems (2015) ESKITU053 Manage the operation of digital systems (2015) ESKITU060 Use IT applications to improve productivity (2015) ESKITU061 Select and use a range of IT applications to develop quality solutions (2015) ESKITU070 Create and edit digital content (2015) ESKITU071 Capture and manipulate multimedia content (2015) ESKITU072 Design and develop interactive digital content (2015) ESKITU081 Retrieve and present structured data (2015) ESKITU082 Process a range of structured data types (2015) ESKITU083 Model and analyse structured data (2015)					
E Health Competency Framework: Defining the Role of the Expert Clinician	2011	Academy of Medical Royal Colleges	Framework	Health – Medical Staff	UK
IT Skills Pathway	2011	NHS	Curricula	Health	UK
Telehealthcare Competency Framework for Health and Social Care Professionals. Final Draft	2011	Barry & Henderson	Framework	Health	UK
Digital and information literacy framework	2012	The Open University	Framework	Higher Education	UK
General Practice Nurse competencies	2012	Royal College of General Practitioners: General Practice Foundation	Framework	Health - Nursing	UK
Learning to Manage Health Information: a theme for clinical education 2012. Making a difference.	2012	eICE	Curricula	Health	UK

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Title	Date	Author(s)	Type	Sector	Country
European e-Competence Framework	2012	European Committee for Standardization	Framework	Information Professionals	Europe
Royal College of Nursing Guidance: Nursing content of eHealth records (2012) Use of digital technology Guidance for nursing staff working with children and young people (2014)	2012-2014	RCN	Guidance	Health - Nursing	UK
Informed "On online introduction to the use of informatics in healthcare"	2013	e-learning for healthcare in partnership with NHS Digital	Curricula	Health and Social care	UK
The Employability Skills Matrix for Health	2013	Skills for Health	Framework	Health	UK
Standards of Proficiency for: Occupational therapists (2013): Arts therapists (2013): Dieticians (2013): Radiographers (2013): Orthoptists (2013): Physiotherapists (2013): Chiropodists / podiatrists (2013) Prosthetists / orthotists (2013): Clinical scientists (2014) Speech and language therapists (2014) Clinical scientists (2014) Operating department practitioners (2014) Paramedics (2014) Hearing aid dispensers (2014) Biomedical scientists (2014) Biomedical scientists (2014) Practitioner psychologists (2015) Social workers in England (2017): Standards: Standards of education and training (2014) Standards of conduct, performance and ethics (2016)	2013-2017	The Health and Care Professions Council	Standards	Health - AHP	UK
General Medical Council Standards & Guidance: Doctors' use of social media: Guidance (2013) GMC Outcomes for Graduates (2015)	2013 - 2016	GMC	Guidance	Health - Medics	UK

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Title	Date	Author(s)	Type	Sector	Country
Promoting excellence: standards for medical education and training (2015)					
Achieving good medical practice (2016)					
Generic Professional Capabilities Framework (2016)					
Apprenticeship Standards for: Senior Healthcare Support Worker, L3 Laboratory Technician, L3: Business Administrator L3 Healthcare Science (HCS) Associate L4 Data Analyst, L4 Regulatory Compliance Officer L4 Dental Technician, L5	2014 - 2017	Institute for Apprenticeships	Standards	Further & Higher Education	UK
Knowledge And Skills Sets To Embed Electronic Assistive Technology (eAT) In Social Care	2014	Skills for Care & Development	Framework	Social Care	UK
Informatics Competencies for Every Practicing Nurse: Recommendations from the TIGER Collaborative	2014	TIGER Collaborative	Framework	Health - Nursing	EU/USA
Scoping the potential for a core capability framework for using technology to support improvement and transformation of health and social services	2014	SMCI Associates	Research Report/ Framework	Health & Social Care	UK
Quality and safety education for nurses	2014	QSEN Institute	Framework	Health - Nursing	USA
Basic Digital Skills framework	2015	Go ON UK	Framework	Citizens	UK
Digital and Technology Skills Matrix V. 1.0	2015	Cabinet Office	Framework	Civil service	UK
National Informatics Standards for Nurses and Midwives	2015	Australian Nursing and Midwifery Federation Standards	Framework	Health - Nursing	Australia
Preparing for the data revolution: identifying minimum health information competencies among the health workforce	2015	Whittaker, Hodge, Mares & Rodney	Research Article	Health	Australia
Refining a self-assessment of informatics competency scale using Mokken scaling analysis	2015	Yoon Shaffer & Bakken	Research Article	Health	USA
Specialty Training Curriculum for Clinical Radiology	2016	Royal College of Radiologists	Curricula	Health – Medics	UK
Core Module 3: Information Technology, Clinical Governance and Research	2016	Royal College of Obstetricians and Gynaecologists	Curricula	Health – Medics	UK

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Title	Date	Author(s)	Type	Sector	Country
DigComp 2.0: The Digital Competence Framework for Citizens Update Phase 1: The Conceptual Reference Model	2016	Vuorikari, Punie, Carretero, & Van den Brande	Framework	Citizens	Europe
Core digital skills in social care	2016	Skills for Care	Framework	Social Care	UK
Public Health Skills & Knowledge Framework	2016	Public Health England	Framework	Health & Social Care	UK
Care Navigation: A Competency Framework	2016	NHS HEE	Framework	Health	UK
Skills Framework for the Information Age version 6	2016	SIFA	Framework	Business	UK
Basic Digital Skills Standards (Draft for Consultation)	2016	The Tech Partnership	Framework	Citizens	UK
Competencies required for nursing telehealth activities: A Delphi-study	2016	van Houwelingen, Moerman, Ettema, & ten Cate	Research Article	Health - Nursing	The Netherlands
Nursing Informatics Competency Assessment for the Nurse Leader: Instrument Refinement, Validation, and Psychometric Analysis.	2017	Yen, Phillips, Kennedy, & Collins	Research Article	Health - Nursing	USA
The HITCOMP Tool and Repository	2017	HITCOMP	Framework	Health	EU/USA

Appendix 3: Competency Mapping Tables

Table 3: UK Health & Social Care: Sector Skills Councils

HEE Domains (2016)		National Occupational Standards (2009-2015) ¹	Knowledge and Skills Sets to Embed Electronic Assistive Technology (eAT) In Social Care (Skills for Care and Development, 2014) ¹	Core digital skills in social care (Skills for Care, 2016)
Key	Title: Performance Criteria/Knowledge & Understanding	Key Area: Competence: Knowledge/Skill Needs	Domain: Competency	
Communication, collaboration and participation	SFHGEN31 Initiate, and participate in, networks and discussion groups		Sharing Data: - safely share data with colleagues in other organisations/ professions Using Digital Skills in Direct Care - know how to help someone access services on-line (such as claiming benefits, paying rent, booking appointments) - know how to set up and support a remote medical consultation for a person you support	
	ESKITU030 Participate in online networks and social media			
	ESKITU031 Select and use collaborative IT tools and social networks			
	ESKITU020 Use digital communications			
Teaching, learning and self-development	ESKITU032 Moderate the use of collaborative IT tools and social networks		Learning & Development: - be able to create a log in and password for a learning account - be able to print off evidence of completion of learning - access mobile learning via a tablet or smart phone - record learning digitally for a portfolio - be able to bookmark a page so it's easy to find again	
	ESKITU033 Manage collaborative IT tools and social media			
Technical proficiency	SFHSS08: Support the use of information technology e.g., P1 start up your equipment according to the manufacturer's instructions P2 log on to the system as required, with the correct identification and password P3 format, label and load removable storage media correctly P4 choose available software that will help you to carry out each piece of work efficiently	KS1 Confidence in Technology: KS1.1 Digital literacy - How to use everyday IT devices such as mobile phones/smart phones/ smart TVs / games consoles/ computers - the way that IT and other eAT devices are powered and the importance of powering/ recharging them - hazards associated with IT and eAT devices because they are electrically powered - the importance of security measures when using the internet	Sharing Data: - know how to safely use password protection - be able to complete digital records accurately. - be able to store information safely - be able to safely use insertable and removable storage devices - read, send and receive email communication Learning & Development: - be able to bookmark a page so it's easy to find again	
	SFHSS33 Enter, retrieve and print data in a database P6 use program help files effectively P12 use the available software facilities to modify the document format, as required			

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HEE Domains (2016)		National Occupational Standards (2009-2015) ¹	Knowledge and Skills Sets to Embed Electronic Assistive Technology (eAT) In Social Care (Skills for Care and Development, 2014) ¹	Core digital skills in social care (Skills for Care, 2016)
Key	Title: Performance Criteria/Knowledge & Understanding	Key Area: Competence: Knowledge/Skill Needs	Domain: Competency	
	K5 how to use the available software and automated facilities K13 how to use the software functions to make simple modifications to the report format CFASAA231 Use IT to support your role: Handle files Edit, format and check information Send and receive e-mails Purposes of using IT Email facilities Problems with Exchanging Information (by email)	KS 6 Remote or virtual monitoring and response systems: KS 6.3 Making and handling calls	Using Digital Skills in Direct Care: - know how to help someone use their diabetes app - know how to help someone with their falls monitor Managing Information: - home care: know how to use a remote monitoring system via a smart phone - home care/day support: know how to update a digital care plan - residential or nursing care: know how to update digital handover records in a skilled way. - follow and demonstrate understanding of the need for safety and security practices. - demonstrate how to create, use and maintain secure passwords; - demonstrate how to minimise the risk of computer viruses	
	SFHGH115 Develop a specification for systems that meet the needs of staff, patients and the public for health information K12 the ways in which staff and other users interact with health information systems			
	SFHGEN32 Search information, evidence and knowledge resources and communicate the results K22 the types of problems that may occur during a search and how these may be overcome (including technical failure, software failure, quantity of information and unexpected results)			
	ESKITU020 Use digital communications			
	ESKITU021 Select and configure a range of digital communications media			
	ESKITU022 Manage digital communications using a range of media			
	ESKITU050 Use digital systems			
	ESKITU051 Configure digital systems			
	ESKITU052 Optimise performance of digital systems			
	ESKITU053 Manage the operation of digital systems			
Information, data and media literacies	ESKITU060 Use IT applications to improve productivity			
	SFHSS33 Enter, retrieve and print data in a database e.g., P3 input, amend and delete data accurately and completely using the correct procedures P4 use available automated facilities for checking data P5 find the required data using agreed procedures P7 maintain data integrity, following your organisation's procedures	KS 6 Remote or virtual monitoring and response systems: KS 6.2 Interpreting data	Learning & Development: - use search techniques to locate and select relevant information. - recognise and take account of currency, relevance, bias and copyright when selecting and using information.	

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HEE Domains (2016)		National Occupational Standards (2009-2015) ¹	Knowledge and Skills Sets to Embed Electronic Assistive Technology (eAT) in Social Care (Skills for Care and Development, 2014) ¹	Core digital skills in social care (Skills for Care, 2016)
Key	Title: Performance Criteria/Knowledge & Understanding	Key Area: Competence: Knowledge/Skill Needs	Domain: Competency	
	CFASAA231 Use IT to support your role: Search for information on the internet or an intranet Producing information SFHGEN31 Initiate, and participate in, networks and discussion groups K15 the ways in which ICT can be used to help capture knowledge		Using Digital Skills in Direct Care: - have the required skills and knowledge to research local activities for a person you support Managing Information: - work with files, folders and other media to access, organise, store, label and retrieve information	
	SFHHL15 Develop a specification for systems that meet the needs of staff, patients and the public for health information K8 the different ways in which data, information and knowledge are used in care			
	SFHGEN32 Search information, evidence and knowledge resources and communicate the results			
	SFHHL19 Search for clinical information and evidence according to an accepted methodology			
	ESKITU010 Source digital information			
	ESKITU011 Organise digital information			
	ESKITU012 Interpret digital information			
	ESKITU013 Develop digital information strategies			
	ESKITU081 Retrieve and present structured data			
	ESKITU082 Process a range of structured data types			
Creation, innovation, scholarship	ESKITU083 Model and analyse structured data			
	ESKITU061 Select and use a range of IT applications to develop quality solutions			
	ESKITU071 Capture and manipulate multimedia content			
	ESKITU070 Create and edit digital content			
	ESKITU072 Design and develop interactive digital content			

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HEE Domains (2016)		National Occupational Standards (2009-2015) ¹	Knowledge and Skills Sets to Embed Electronic Assistive Technology (eAT) in Social Care (Skills for Care and Development, 2014) ¹	Core digital skills in social care (Skills for Care, 2016)
Key	Title: Performance Criteria/Knowledge & Understanding	Key Area: Competence: Knowledge/Skill Needs	Domain: Competency	
Digital identity, wellbeing, safety and security	SFHSS08: Support the use of information technology K2 the basic requirements of data protection legislation and health and safety legislation and other relevant legal requirements	KS2 Rights, Values and eAT: KS 2.2 Dignity, Autonomy, privacy and confidentiality	Sharing Data: - know how to safely share appropriate data with colleagues Managing Information: - follow and demonstrate understanding of the need for safety and security practices. - demonstrate how to create, use and maintain secure passwords; - demonstrate how to minimise the risk of computer viruses	
	CFASAA231 Use IT to support your role: K28 what laws and guidelines affect the day-to-day use of IT, such as about Data Protection, Equal Opportunities, Disability, Health and Safety, copyright and guidelines set by your employer or organisation K29 what and how different IT activities are affected by laws and guidelines, such as storing names and addresses, downloading images from the internet or sending inappropriate emails			
	SFHGEN31 Initiate, and participate in, networks and discussion groups K2 the importance and reasons for adhering to information governance			
	SFHH115 Develop a specification for systems that meet the needs of staff, patients and the public for health information P3 check conformity with information governance in accordance with legislation and organisational requirements			
	ESKITU031 Select and use collaborative IT tools and social networks - perform appropriate checks on others' online identities to safeguard self and others - how to check someone's online identity			
	ESKITU040 Use safe and secure practices when working with digital systems ESKITU041 Set up security software for digital systems ESKITU042 Implement security procedures for digital systems			

Table 4a: UK Health & Social Care: Professional and Regulatory Bodies Frameworks/Standards

HEE Domains (2016)	Nursing and Midwifery Council Standards (2001-2015) ¹	UKCHIP Standards for Registration (UKCHIP, 2009) ¹	E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011) ¹	General Practice Nurse Competencies (RCGP 2012) ¹
Key	Standard Title (date): Standard	Standard: Competency	Section: Competence: Objectives: Knowledge/ Skills/ Behaviours	Domain: Competencies
Communication, collaboration and participation	Standards for pre-registration midwifery education (2009): Communicates with colleagues verbally (face-to-face and by telephone) and in writing and electronically and checks that the communication has been fully understood Standards for pre-registration nursing education (2010): Programme providers must ensure that the following content is included... communication and healthcare informatics AEIs must ensure that selection and admission criteria include evidence of ability to communicate clearly and effectively in writing, including using a computer	2.2 Generic Professional Standards: 2.2.4 Communication and Professional Relationships	5. Clinical Care Records: 5.2 Patient access to health information: Clinicians should be able to provide informed support to patients on: The range of online sources patients use to obtain information about their health, medical conditions and availability of services, including search engines, websites, discussion groups and social networks Recognise that patient-controlled systems can improve their experience of healthcare and empower them to become equal partners in the care process 6. Clinical IT Systems and Technologies: 6.1 Integrated Healthcare: Understand the content, functionality and benefit of an integrated health record Understand differing models of IT system deployment in a healthcare environment, where care is provided across many different organisational settings Understand the mechanisms by which IT systems can be joined together reliably and safely to support information flows across the health service 6.2 Clinical IT systems: Recognise how clinical IT systems within acute, community and mental health sectors can support safe and effective clinical practice 6.5 Medicines Management: Appreciate how electronic systems can facilitate and enhance the communication of a prescription or medicine order, aid the choice, administration and supply of medicines through knowledge and decision support and provide a robust audit trail for the entire medicines use process 6.6 Infrastructure and Technologies: Recognise how technologies can be used to improve communication between healthcare professionals and ensure efficient service delivery	
	Communicates with colleagues verbally, face-to-face and by telephone, and in writing and electronically in a way that the meaning is clear, and checks that the communication has been fully understood. They must communicate effectively using a wide range of strategies and interventions including the effective use of communication technologies. Standards for competence for registered nurses (2014): Decision-making must be shared with service users, carers, families and informed by critical analysis of a full range of possible interventions, including the use of up-to-date technology.			

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HEE Domains (2016)	Nursing and Midwifery Council Standards (2001-2015) ¹	UKCHIP Standards for Registration (UKCHIP, 2009) ¹	E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011) ¹	General Practice Nurse Competencies (RCGP 2012) ¹
Key	Standard Title (date): Standard	Standard: Competency	Section: Competence: Objectives: Knowledge/Skills/ Behaviours	Domain: Competencies
	use a range of communication skills and technologies to support person-centred care and enhance quality and safety.		6. 7 Telehealthcare: Recognise the role of telecare in helping individuals to stay independent at home, and the support it can give to their carers 2. Clinical Leadership and Management: 2. 1 Clinical Leadership and Team working: Keep up to date with eHealth related issues relevant to delivery of future services 2.5 Setting Direction: Be aware of NHS national projects, initiatives and developments in the field of healthcare information technology Be aware of eHealth strategies and developments in other international countries which many influence future UK strategies 3. IT Healthcare Projects: 3.2 Sourcing, developing and implementing healthcare information and communication technology systems and applications Understand the need for all healthcare staff to be IT literate and able to use all aspects of eHealth safely, effectively and efficiently 7. Knowledge Management: 7. 1 Decision Support: Be aware of the current status of research and development in the area of Computer Aided [sic] Diagnosis tools and personalised medicine, in particular the use of biomarkers, image analysis and other tools for managing treatment 7.2 eLearning: Recognise the relevance of eLearning and how it can be designed and used to achieve curricular objectives and promote better patient care	
Teaching, learning and self-development				
Technical proficiency	Standards for pre-registration midwifery education (2009): Indicative content: Use of electronic records, texting, facsimile, verbal instructions	2.3 Generic Informatics Standards: 2.3.2 ICT Usage 2.3.12 Information Technology 2.3.13 Systems Development & Implementation 2.3.14 Interoperability and Integration 2.3.15 Technical Standards 2.3.19 Document and Records Management	3. IT Healthcare Projects: 3. 1 Project Leadership: Understand the factors linked to successful completion or failure of healthcare IT projects and the evaluation processes involved 3.2 Sourcing, developing and implementing healthcare information and communication technology systems and applications 3.3 Maintenance and support of healthcare IT systems:	Information and Knowledge: Use a computer and manage files Record, retrieve and access information Be able to access and send emails including attachments

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HEE Domains (2016)	Nursing and Midwifery Council Standards (2001-2015) ¹	UKCHIP Standards for Registration (UKCHIP, 2009) ¹	E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011) ¹	General Practice Nurse Competencies (RCGP 2012) ¹
Key	Standard Title (date): Standard	Standard: Competency	Section: Competence: Objectives: Knowledge/Skills/ Behaviours	Domain: Competencies
		2.5 Specialised Informatics Standards: 2.5.7 Interoperability and Integration 2.5.8 Technical Standards	6. Clinical IT Systems and Technologies: 6.1 Integrated Healthcare: Recognise that for successful interoperability or integration to be achieved systems must either adhere to certain informatics standards or rely on middleware to supplement any technology or data transformations resulting from lack of standardisation 6.3 Electronic test requesting and results reporting: Understand how computerised order entry systems can be used for test requesting and the risks and benefits associated with this process 6.6 Infrastructure and Technologies:	
	Standards for specialist education and practice (2001): Indicative Content: 12. 15 appreciation of information technology and its application to practice Standards for pre-registration midwifery education (2009): Manage and develop care utilising the most appropriate information technology (IT) systems. This will include: - recording practice in consistent formats on IT systems for wider-scale analysis - using analysis of data from IT systems and applying this to practice	2.3 Generic Informatics Standards: 2.3.3 Data Quality 2.3.5 Data: Information and Knowledge 2.3.6 Collection of Data, Information and Knowledge 2.3.7 Validation and Processing of Data, Information and Knowledge 2.3.8 Appraisal, Analysis and Interpretation of Data, Information and Knowledge 2.3.9 Presentation and Dissemination of Data, Information and Knowledge 2.3.10 Monitor, Evaluate and Improve the management of Data, Information and Knowledge 2.3.16 Information Systems Strategy	2. Clinical Leadership and Management: 2.2 Managing Services and Performance: Understand the need to critically appraise information provided and to ensure that data is accurate and up-to-date Recognise how IT systems should provide information to measure performance against local and national targets and the need for this information to be open and transparent Recognise that the process of healthcare can be analysed in the same way as any business process and that business intelligence and analytics can be used to help improve patient care 2.3 Improving Services: Understand the limitations of metrics, the difference between quantitative and qualitative data and the concept of dynamic quality 3. IT Healthcare Projects: 3.3 Maintenance and support of healthcare IT systems: Understand what processes need to be put in place so that clinical care is not compromised if clinical IT systems are not available 4.1 Collection and storage of health information: 4.3 Using and Sharing health information 6. Clinical IT Systems and Technologies: 6.2 Clinical IT systems:	Information and Knowledge: Review and process data using accurate read codes about patients, in order to ensure easy and accurate retrieval for monitoring and audit purposes, for example Quality Management and Analysis System (OMAS) and Calculating Quality Reporting System (CQRS) including the appointment system Record, retrieve and access information Manage information searches using the internet and local library databases for example the retrieval of relevant information for patients on their condition/diagnosis
Information, data and media literacies	Standards for pre-registration nursing education (2010): All nurses must maintain accurate, clear and complete records, including the use of electronic formats, using appropriate and plain language. People can trust a newly registered graduate nurse to keep and maintain accurate records using information technology, where appropriate, within a multi-disciplinary framework as a leader and as part of a team and in a variety of	2.5 Specialised Informatics Standards: 2.5.2 Data, Information and Knowledge in Health and Social Care 2.5.4 Primary and Secondary Uses of Data in Health and Social Care 2.5.5 Information Systems in Health and Social Care		

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HEE Domains (2016)	Nursing and Midwifery Council Standards (2001-2015) ¹	UKCHIP Standards for Registration (UKCHIP, 2009) ¹	E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011) ¹	General Practice Nurse Competencies (RCGP 2012) ¹
Key	Standard Title (date): Standard	Standard: Competency	Section: Competence: Objectives: Knowledge/Skills/ Behaviours	Domain: Competencies
	care settings including at home. Standards for competence for registered midwives (2014): Manage and develop care utilising the most appropriate information technology (IT) systems. This will include: • recording practice in consistent formats on IT systems for wider-scale analysis; • using analysis of data from IT systems and applying this to practice; and • evaluating practice based on data analysis. Standards for competence for registered nurses (2014): maintain accurate, clear and complete records, including the use of electronic formats, using appropriate and plain language	2.5.9 Information Systems Strategy in Health and Social Care 2.5.10 Clinical Coding and Terminology 2.5.11 Health Records	Recognise how information in clinical IT systems can be used for secondary uses, such as audit and research, service planning and resource allocation Recognise how systems facilitate health screening and disease surveillance Understand how clinical IT systems support healthcare business Processes Understand how primary care IT systems support comprehensive, life-long clinical records and how information from other health and social care sectors is incorporated into these records 6.4 Digital Imaging: Understand the interface between Radiology Information Systems (RIS) and PACS and the functionality of RIS 6.5 Medicines Management: To understand how technology can improve the medicines administration process and provide data to support quality improvement 7. Knowledge Management: 7.1 Decision Support: Recognise how decision support, clinical guidelines and evidence based clinical pathways within clinical IT systems enhance delivery of clinical care, particularly when embedded into clinical workflows 2. Clinical Leadership and Management: 2.3 Improving Services: Recognise how information technology and informatics can be used to support change and transformation, to benchmark performance and to promote a culture of excellence and achievement 2.5 Setting Direction: • Adopt innovation that has been successfully used or piloted elsewhere without trying to invent new solutions for the same problem Anticipate emerging trends that will influence future strategy Encourage adoption of eHealth into the core delivery of care, prevention and public health	
Creation, innovation, scholarship	The Code (2015) 20.10 Use all forms of spoken, written and digital communication (including social media and networking sites) responsibly, respecting the right to privacy of others at all times.	2.3 Generic Informatics Standards: 2.3.11 Develop models for processing new data and information 2.5 Specialised Informatics Standards: 2.5.6 Current and Emerging Systems		

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HEE Domains (2016)	Nursing and Midwifery Council Standards (2001-2015) ¹	UKCHIP Standards for Registration (UKCHIP, 2009) ¹	E Health Competency Framework: Defining the Role of the Expert Clinician (AMRC 2011) ¹	General Practice Nurse Competencies (RCGP 2012) ¹
Key	Standard Title (date): Standard	Standard: Competency	Section: Competence: Objectives: Knowledge/ Skills/ Behaviours	Domain: Competencies
			5. Clinical Care Records: 5.2 Patient access to health information: Edit Wikipedia articles relevant to your area of specialist expertise to improve their quality 6. Clinical IT Systems and Technologies: 6.6 Infrastructure and Technologies: Recognise that rapid advancements in technology will influence future delivery of clinical services	
Digital identity, wellbeing, safety and security		2.3 Generic Informatics Standards: 2.3.4 Information Governance and Security 2.5 Specialised Informatics Standards: 2.5.1 Protection of Individuals and Organisations 2.5.3 Information Governance in Health and Social Care	3. IT Healthcare Projects: 3.3 Maintenance and support of healthcare IT systems: Recognise the need for continuous monitoring of system safety and performance Understand what processes need to be put in place so that clinical care is not compromised if clinical IT systems are not available 4. Working With Information: 4.2 Safe care of clinical information: 5. Clinical Care Records: 5.2 Patient access to health information: Recognise that data about the patient is for the patient; that the clinician is a custodian of the data, not the owner of the data, and that the patient or their authorised representative have a right to apply to see or obtain a copy of certain personal data held about them, including health records 6. Clinical IT Systems and Technologies: 6.2 Clinical IT systems: Recognise how these systems can contribute to improving patient safety, and quality assurance	

Table 4b: UK Health & Social Care: Professional and Regulatory Bodies Standards

HEE Domains (2016)		HCPC Standards (2013-2017) ¹	GMC Standards (2015-2016) ¹	Specialty Training Curriculum for Clinical Radiology (RCOR, 2016) ¹	Core Module 3: Information Technology, Clinical Governance and Research (RCOG, 2016) ¹
Key		Profession/Standard(Year): Standard/Statement	Standard Title (Year): Statement/Domain: Skills	Generic Content Area: Knowledge/ Skills/Behaviours	Area: Knowledge/ Competency/ Skills & Attitudes
Communication, collaboration and participation		Standards of conduct, performance and ethics (2016): You must use all forms of communication appropriately and responsibly, including social media and networking websites.	GMC Outcomes for Graduates (2015): 19. Use information effectively in a medical context b. Make effective use of computers and other information systems, including storing and retrieving information. d. Access information sources and use the information in relation to patient care, health promotion, advice and information to patients, and research and education. e. Apply the principles, method and knowledge of health informatics to medical practice		
			Generic Professional Capabilities Framework (2016): Professional skills: adapting their communication style to suit the individual patient, for example by using email or Skype.		
Teaching, learning and self-development		Clinical scientists (2014) recognise the need to be aware of emerging technologies and new developments Standards of education and training (2014): The learning resources, including IT facilities, must be appropriate to the curriculum and must be readily available to students and staff.	Promoting excellence: standards for medical education and training (2015): Learners must have access to technology enhanced and simulation based learning opportunities within their training programme as required by their curriculum.		Use of Information Technology: - Understand the effective use of computing systems including ePortfolios to support training - Engage with ePortfolios as required - Adopt a proactive and enquiring attitude to new technology
		Occupational therapists (2013): Arts therapists (2013): Dietitians (2013): Radiographers (2013): Orthoptists (2013): Physiotherapists (2013): Chiropodists / podiatrists (2013) Prosthetists / orthotists (2013): Speech and language therapists (2014)	Generic Professional Capabilities Framework (2016): Professional skills: able to demonstrate appropriate IT skills, including word processing and data collection	HE: Information Technology Understand modern communication, search strategies, data storage and security Demonstrate competent use of relevant computer technology	Use of Information Technology: Demonstrate competent use of databases, word processing techniques, statistics programmes and electronic mail
Technical proficiency					

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HEE Domains (2016)		HPCPC Standards (2013-2017) ¹	GMC Standards (2015-2016) ¹	Specialty Training Curriculum for Clinical Radiology (RCOR, 2016) ¹	Core Module 3: Information Technology, Clinical Governance and Research (RCOG, 2016) ¹
	Key	Profession /Standard(Year): Standard/Statement	Standard Title (Year): Statement/Domain: Skills	Generic Content Area: Knowledge/ Skills/Behaviours	Area: Knowledge/ Competency/ Skills & Attitudes
		Clinical scientists (2014) Operating department practitioners (2014) Paramedics (2014) Hearing aid dispensers (2014) Biomedical scientists (2014) Practitioner psychologists (2015) be able to use information and communication technologies appropriate to their practice			
		Biomedical scientists (2014) understand the importance of backup storage of electronic data			
		Social workers in England (2017): be able to demonstrate a level of skill in the use of information technology appropriate to their practice			
Information, data and media literacies		Biomedical scientists (2014) be able to use statistical packages and present data in an appropriate format	Generic Professional Capabilities Framework (2016): Capabilities in research and scholarship: understand informatics	H5. Information Technology Engage with information technology relevant to clinical practice	Use of Information Technology: - Understand the principles of storage, retrieval, analysis and presentation of data - Understand the range of uses of clinical data and its effective interpretation - Retrieve and use data recorded in clinical systems - Search medical literature including use of PubMed, Medline, Cochrane Reviews and the internet - Undertake searches, and access web sites, and health-related databases - Present data in an understandable manner Research: - Demonstrate the use of literature databases Use of Information Technology: Demonstrate the ability to apply IT solutions in the management of patients
Creation, innovation, scholarship					

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HEE Domains (2016)		HCPC Standards (2013-2017) ¹	GMC Standards (2015-2016) ¹	Specialty Training Curriculum for Clinical Radiology (RCOR, 2016) ¹	Core Module 3: Information Technology, Clinical Governance and Research (RCOG, 2016) ¹
	Key	Profession /Standard/ Year): Standard/Statement	Standard Title (Year): Statement/Domain: Skills	Generic Content Area: Knowledge/ Skills/Behaviours	Area: Knowledge/ Competency/ Skills & Attitudes
Digital identity, wellbeing, safety and security		Occupational therapists (2013): Arts therapists (2013): Dieticians (2013): Radiographers (2013): Orthoptists (2013): Physiotherapists (2013): Chiropodists / podiatrists (2013): Prosthetists / orthotists (2013): Speech and language therapists (2014) Operating department practitioners (2014) Paramedics (2014) Hearing aid dispensers (2014) Biomedical scientists (2014) Practitioner psychologists (2015) understand the principles of information governance and be aware of the safe and effective use of health and social care information	GMC Outcomes for Graduates (2015): 19. Use information effectively in a medical context c. Keep to the requirements of confidentiality and data protection legislation and codes of practice in all dealings with information. Achieving good medical practice (2016): Practical tip #9: Social media dos and don'ts • check your privacy settings so you know who can see what on the platforms you use. But remember that social media sites cannot guarantee confidentiality whatever privacy settings you use • remember that the apps you use may link to your social media profile and that information from that site may be seen by users of the app • Don't share information about patients or post information that could identify a patient		Use of Information Technology: Be aware of the confidentiality issues

Table 4c: UK Health & Social Care: Professional and Regulatory Bodies Guidance

HEE Domains (2016)		Nursing content of eHealth records (RCN, 2012) ¹	Doctors' use of social media: Guidance (GMC, 2013) ¹	Use of digital technology Guidance for nursing staff working with children and young people (RCN, 2014) ¹	Guidance on using social media responsibly (NMC, 2016) ¹
Key	Guidance	Guidance	Guidance	Guidance	Statement ⁸ : Guidance
Communication, collaboration and participation	1. Standards for the nursing content of electronic records are essential for patient safety, and to support best practice, reduce duplication of effort, and support the provision of nursing data for resource management, quality improvement, service planning, and research.(p3)				Paragraph 8.2: "You must work cooperatively with your colleagues and this includes communicating in an appropriate way when you use social media" (p5)
Teaching, learning and self-development					
Technical proficiency				"develop your own online confidence and competence, as children can then discuss issues about their online use, and know that you understand" (p5)	
Information, data and media literacies	3. Nursing information in the record needs to be structured using national standardised terminology to enable, for example, links to decision support, the creation of messages, and the provision of data for analyses. Standardised terminology is essential to avoid ambiguity and to enable data to be aggregated and compared.(p3) 4. The primary driver for deciding on nursing content in electronic records must be patient care. Systems should enable 'record (RCGP General Practice Foundation, 2012)once, use many times for many purposes'. Data to support commissioning, workforce planning, performance monitoring, quality improvement and research ('measure and compare') should be derived wherever possible from record content defined for primary use ('care and share'), with appropriate safeguards.(p4)				

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HEE Domains (2016)	Nursing content of eHealth records (RCN, 2012) ¹	Doctors' use of social media: Guidance (GMC, 2013) ¹	Use of digital technology Guidance for nursing staff working with children and young people (RCN, 2014) ¹	Guidance on using social media responsibly (NMC, 2016) ¹
Key	Guidance	Guidance	Guidance	Statement ^a : Guidance
Creation, innovation, scholarship		Anonymity: "If you identify yourself as a doctor in publicly accessible social media, you should also identify yourself by name. Any material written by authors who represent themselves as doctors is likely to be taken on trust and may reasonably be taken to represent the views of the profession more widely." (p3)		Paragraph 6: "As a nurse or midwife, you have a responsibility to ensure that any information or advice that you provide via social media is evidence-based and correct to the best of your knowledge. You should not discuss anything that does not fall within your level of competence and you should avoid making general comments that could be considered inaccurate" (p5)
Digital identity, wellbeing, safety and security	5. The content of electronic records must be SAFER. There are different risks associated with recording and using information in electronic records compared with paper records. Those undertaking quality assurance for systems or standards need to assure themselves that that the content represents faithfully the meaning intended by the person recording it, and that this meaning will be preserved. They also need to ensure that the systems and the way they are used are SAFER (p4)	Privacy: "You should be aware of the limitations of privacy online and you should regularly review the privacy settings for each of your social media profiles." This is for the following reasons: a Social media sites cannot guarantee confidentiality whatever privacy settings are in place. b Patients, your employer and potential employers, or any other organisation that you have a relationship with, may be able to access your personal information. c Information about your location may be embedded within photographs and other content and available for others to see." (p2)	"help the child or young person to understand appropriate boundaries, what constitutes personal information, and develop their digital literacy (for example understanding e-security issues, how websites work, their privacy and reputation online, what sorts of online friends to add)" (p5) "Involve the child or young person in decisions affecting their online use; help them to develop their own sense of responsibility and wellbeing and create a culture of openness and support so that they feel able to talk with you if things go wrong." (p5)	Paragraph 1.1: "Do not post anything on social media that may be viewed as discriminatory, does not recognise individual choice or does not preserve the dignity of those receiving care" (p4) Paragraph 5: "It is unacceptable for nurses and midwives to discuss matters related to the people in their care outside clinical settings. If you refer to your work or study on social media you need to demonstrate respect and professionalism towards all your patients or service users by respecting their right to privacy and confidentiality. This is regardless of whether you believe that there is a risk they could be identified." (p4) Paragraph 16: "Social media should not be used to harass or victimise someone, or to attempt to prevent or discourage someone from raising their concerns" (p5)

^a Nursing & Midwifery Council (2015) The Code: Professional standards of practice and behaviour for nurses and midwives. London NMC

Table 5a: UK Health & Social Care: National NHS Bodies Standards and Guidance

HEE Domains (2016)		Learning to Manage Health Information: a theme for clinical education 2012. Making a difference. (eICF, 2012)	Public Health Skills & Knowledge Framework (PHE, 2016) ¹	Care Navigation: A Competency Framework (NHS HEE, 2016) ¹
	Key	Section: Learning Outcome	Area: Function: Sub-Function	Domain: Sub-Core Competencies (Level)
Communication, collaboration and participation		Data, Information and Knowledge Understand how routine direct online access to their records provides patients with evidence-based information to help them make decisions about care, including self-care.	C. Delivery: C2 Communicate:	1. Effective communication: Writes and maintain clear, accurate records of patient information in a variety of formats (i.e. electronic and paper). (Essential)
		Communication and Information Transfer: - Demonstrate understanding of different communication methods and technologies and their appropriate application in support of clinical practice. - Ability to effectively send and receive information from other professionals, in written or electronic formats within guidelines of confidentiality and security. - Review the current arrangements for electronic communications with patients or carers and the scope for further development.		8. Handling data and information: Manage and maintain an electronic up-to-date 'directory' of local services (Enhanced)
Teaching, learning and self-development		Clinical Systems and Applications: Demonstrate understanding of how and why information technology is able to support clinical practice and new ways of working		
		eHealth: the Future Direction of Clinical Care: Demonstrate understanding of the implications of eHealth applications for patients and clinical staff, clinical practice and communications.		
Technical proficiency		Clinical Systems and Applications: - Demonstrate skill in the use of clinical systems in a range of settings, including sharing the personal health record between clinician and patient. - Demonstrate awareness of clinical systems errors / reliability (e.g. transfer of data between platforms; data entry errors).		

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HEE Domains (2016)	Learning to Manage Health Information: a theme for clinical education 2012. Making a difference. (eICE, 2012)	Public Health Skills & Knowledge Framework (PHE, 2016) ¹	Care Navigation: A Competency Framework (NHS HEE, 2016) ¹
Key	Section: Learning Outcome	Area: Function: Sub-Function	Domain: Sub-Core Competencies (Level)
Information, data and media literacies	Data, Information and Knowledge • Demonstrate understanding of the principles of effective quality control and validation of data and information in clinical practice. • Summarise, evaluate, appraise and present information / evidence relevant to a particular healthcare issue obtained from accredited online and other sources. • Analyse sources of information about patient and public views and expectations for healthcare and related services. • List the range, purposes, benefits and potential risks of aggregating clinical data. • Outline the secondary uses of patient information for health research and managing and planning care. • Demonstrate an understanding of the use of patient data for research. • Demonstrate understanding of the relationship and differences between data and information and how both can be used to support clinical practice and service management. Health and Care Records: • Understand and discuss the implications of patient held and patient accessible clinical information for interprofessional clinical practice and multidisciplinary care. The Language of Health: Clinical Coding and Terminology:	A. Technical: A1 Data & Intelligence: A4 Evidence Base for PH:	8. Handling data and information: • Access, input to and use data from appropriate electronic records, databases and spread sheets. (Essential) • Use appropriate technology and resources to find and process information (Essential) • Demonstrate analytical skills in using data and information processing. (Enhanced) • Research and interpret relevant information from a range of resources. (Enhanced) • Analyse and present data and information to teams and commissioners. (Enhanced) • Research and critically appraise information from a range of resources (Expert)
	Protection of Individuals and Organisations: • Demonstrate understanding of the legislation, regulatory guidance and NHS protocols regarding the security, confidentiality and appropriate sharing of patient identifiable information. • Demonstrate understanding of the benefits and risks of routine online patient record access and how to maximise the benefits for patients and the NHS. • Demonstrate understanding of the different arrangements and the associated responsibilities of clinical staff for security of all types of clinical information, especially electronically held, and for using	A. Technical: A5 Audit & redesign services: A5.2 Appraise new technologies, therapies, procedures and interventions and the implications for developing cost-effective equitable services	
Creation, innovation, scholarship		A. Technical: A1 Data & Intelligence: A1.4 Assess and manage risks associated with using and sharing data and information, data security and intellectual property	
Digital identity, wellbeing, safety and security			

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HEE Domains (2016)	Learning to Manage Health Information: a theme for clinical education 2012. Making a difference. (eICE, 2012)	Public Health Skills & Knowledge Framework (PHE, 2016) ¹	Care Navigation : A Competency Framework (NHS HEE, 2016) ¹
Key	Section: Learning Outcome such data for "secondary" purposes.	Area: Function: Sub-Function	Domain: Sub-Core Competencies (Level)

Table 5b: UK Health & Social Care: National NHS Bodies Standards and Guidance

HEE Domains (2016)	Telehealthcare Competency Framework for Health and Social Care Professionals (Barry & Henderson, 2011) ¹	Employability Skills Matrix for the Health Sector (Skills for Health 2013) ¹
Key	Domain/Staff Group: Function/Task: Competency	Career Level: Employability Skill
Communication, collaboration and participation	Communication/All Communicate effectively with [sic] using a wide range of methods Demonstrates that they can interact with individuals using appropriate methods and systems, including telehealthcare Communication/Managers Organisational Profile Uses communication channels, e.g. intranet, newsletters, internet sites, to update telehealthcare activities and successes routinely to internal staff and external partner agencies.	
Teaching, learning and self-development	Service Delivery/Managers Service development Ensures staff receive regular training opportunities in new telehealthcare service developments	
Technical proficiency		Level 1, 2 Use basic computer skills Level 3, 4, 5 Select, interact with and use technology independently to meet given needs and trouble shoot straightforward problems Level 4, 5, 6, 7, 8, 9 Use technology to plan work effectively and to evaluate the effectiveness

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HEE Domains (2016)	Telehealthcare Competency Framework for Health and Social Care Professionals (Barry & Henderson, 2011) ¹	Employability Skills Matrix for the Health Sector (Skills for Health 2013)
Key	Domain/Staff Group: Function/Task: Competency	Career Level: Employability Skill
		of the system used Level 6, 7, 8, 9 Trouble shoot straightforward problems
Information, data and media literacies		
Creation, innovation, scholarship		
Digital identity, wellbeing, safety and security	Quality/All Recognise importance of informed consent Demonstrates awareness and understanding of relevant legislation, professional and organisational guidance regarding obtaining informed consent for telehealthcare service delivery Adherence to information governance standards when dealing with patient/client data. Health, Safety & Security/All Providing a safe and secure environment for telehealthcare in practice Understands the requirements for a confidential environment to share data/images or, video conference	Level 1, 2 Follow recommended practices to keep information secure Level 3 Store information following agreed procedures for the safety and security of data

Table 6a: UK Health & Social Care: Education Standards and Curricula

HEE (2016)	QAA Benchmark Statements (2001-2017) ¹	Apprenticeship Standards (2015-2016) ¹	Systems of eCare (Sheffield Hallam University, 2009-2017) ¹
Key	Subject: Benchmark Statements	Occupation & Level: Competencies/ Skills/ Knowledge/ Behaviour, etc.	Section: Learning Outcomes
Communication, collaboration and participation	Dietetics (2001): demonstration of appropriate IT skills to communicate with colleagues (e.g. electronic mail) and search for information;	Laboratory Technician, L3: Communicate scientific information appropriately, including the use of Laboratory Information Management systems, either digital or paper based.	Information Intelligence consider issues around information sharing in healthcare settings
	Nursing (2001): use information technology applied to the needs of the patient/client or client group;	Healthcare Science (HCS) Associate L4: Professional Practice and Person-centred Care - use technology to present information orally	Information Future - be aware of near future ICT developments that are intended to support care delivery in a variety of environments - have an insight into the potential ICT developments in design for delivery in healthcare over the next five to ten years - understand your professional role as active participants in future ICT developments where benefit for patients/clients/service users is clear.
	Podiatry (2001): the ability to engage with technology, particularly the effective and efficient use of information and communication technology		
	Dentistry (2002): use information technology as a means of communication, for data collection and analysis, and for self-directed learning;		
	Medicine (2002): - The graduate will be familiar with basic communication and information technology relevant to their duties. - present information clearly in written, electronic and oral forms, and communicate ideas and arguments effectively;		Information Systems understand the role of the personal health record as given in the 2012 NHS Information Strategy
	Dental care professions (2005): use health informatics and information technology as a means of communication, for data collection and analysis, for improving patient care and for self-directed learning		
	Paramedic Science (2015): - confidently and professionally present information using a number of communication strategies and, where appropriate through the use of technology, provide coherent and logical arguments in the support of decision making - use information technology consistent with the effective and efficient management of modern paramedic practice, including the use of enhanced verbal and written presentations.		
	Social Work (2016): understanding the social impact of technology, including the constraints of confidentiality and an awareness of the impact of the 'digital divide', the implications of modern information and communications technology		

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HEE (2016)	QAA Benchmark Statements (2001-2017) ¹		Apprenticeship Standards (2015-2016) ¹	Systems of eCare (Sheffield Hallam University, 2009-2017) ¹
Key	Subject: Benchmark Statements		Occupation & Level: Competencies/ Skills/ Knowledge/ Behaviour, etc.	Section: Learning Outcomes
	for both the provision and receipt of services, use of technologically enabled support and the use of social media as a process and forum for vulnerable people, families and communities, and communities of professional practice.			
	Clinical Sciences (2004): appreciate the importance of awareness of emerging technologies and new developments Counselling and psychotherapy (2013): the ability to use virtual learning environments Health Studies (2016): use information and communications technology to enhance digital capability and digital literacy in a variety of contexts			
Teaching, learning and self-development	Common to all 2001 Benchmarks: The award holder should be able to demonstrate an ability to engage with technology, particularly the effective and efficient use of information and communication technology. Dietetics (2001): ability to use basic packages for word processing and statistical analysis, and understand how to set up databases and spreadsheets; Midwifery (2001): - ability to use relevant electronic patient information systems - demonstrate key transferable skills including: IT Nursing (2001): The award holder should be able to: - use word processing, email, spreadsheets and databases; - use relevant electronic patient information systems Podiatry (2001): Information technology skills that include a knowledge of the use of statistical packages and the ability to make use of word processing packages for report writing Prosthetics and Orthotics (2001): Acquired skills will entail the use of IT hardware and software such as word processing, spreadsheets, the internet, CAD/CAM systems and systems for gait analysis.		Data Analyst, L4: - the fundamentals of data structures, database system design, implementation and maintenance - the processes and tools used for data integration Business Administrator L3: - Skilled in the use of multiple IT packages and systems relevant to the organisation in order to: write letters or emails, create proposals, perform financial processes, record and analyse data. Examples include MS Office or equivalent packages. Able to choose the most appropriate IT solution to suit the business problem Regulatory Compliance Officer L4: - Use IT systems to manage, share and store information in accordance with data protection requirements where appropriate. - Use digital technologies to communicate with and support partner organisations and regulated entities. - Use digital competencies to support the regulation of online markets Dental Technician, L5: Aware of the basic procedures used in design and manufacture of custom made devices (including CAD/CAM & IT Solutions).	
Technical proficiency				

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HEE (2016)	QAA Benchmark Statements (2001-2017) ¹	Apprenticeship Standards (2015-2016) ¹	Systems of eCare (Sheffield Hallam University, 2009-2017) ¹
Key	Subject: Benchmark Statements	Occupation & Level: Competencies/ Skills/ Knowledge/ Behaviour, etc.	Section: Learning Outcomes
	Dentistry (2002): Dental students should acquire transferable skills, including the use of communications and information technology (C&IT) for word-processing, sending electronic mail and accessing information by the world-wide web; working with others in teams; making verbal and written presentations using appropriate audio-visual aids; communication with colleagues and the public. Operating department practice (2004): The award holder should be able to demonstrate the ability to: • use word processing software; • use an appropriate level of patient information systems. Arts Therapy (2004): confidence in engaging with technology in the pursuit of effective AsTs practice including: b) demonstration of appropriate IT skills to communicate with colleagues (e.g. word processing and email) and search for information Counselling and psychotherapy (2013): the use of IT skills, a capacity to use word processing facilities and a capacity to access library information Optometry (2015): technology skills involving word processing, data manipulation, organisation and presentation for self-directed and lifelong learning Health Studies (2016): access and use a range of digital technologies, such as relevant computer packages, apps and data analysis software, as appropriate to the subject Psychology (2016): be computer literate, displaying at the very least skill in the use of word processing, databases and analytic software packages		Data Analyst, L4: e.g., • identify, collect and migrate data to/from a range of internal and external systems • manipulate and link different data sets as required • collect and compile data from different sources • perform database queries across multiple tables to extract data for analysis The Why, What and Where of eCare • gained an understanding of use of information and communications technology (ICT) in NHS England to support the management of care. • gained an initial understanding to information governance as it affects practice. Information Mapping • understand the link between information systems
	Nursing (2001): The award holder should be able to: • access health care research and literature databases; • use the internet as an information source;		
	Midwifery (2001): integrate skills using information technology systems to contribute to the management and development of midwifery care		
	Information, data and media literacies		

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HEE (2016)	QAA Benchmark Statements (2001-2017) ¹	Apprenticeship Standards (2015-2016) ¹	Systems of eCare (Sheffield Hallam University, 2009-2017) ¹
Key	Subject: Benchmark Statements	Occupation & Level: Competencies/ Skills/ Knowledge/ Behaviour, etc.	Section: Learning Outcomes
	Occupational Therapy (2001): Confidence in engaging with technology in the pursuit of effective occupational therapy, including: - familiarity with information technology with regard to presentation and statistical analysis of data including electronic and specialist databases. Orthoptics (2001): - the practical use of information technology, which may be used in the assessment of patients or for record keeping. - show confidence in using technology to analyse clinical outcomes and investigative work in order to deliver evidence-based practice. Physiotherapy (2001): using information technology to identify and access information, to record and manage patient data and to process and analyse research findings; Prosthetics and Orthotics (2001): Confidence in engaging with technology, including understanding, manipulating and interpreting numerical data in the pursuit of effective prosthetic and orthotic practice Radiography (2001): - demonstrate the applications of information technology, data processing, storage, retrieval and manipulation in diagnostic imaging; - effective use of information communication technology in relation to information about or from patients, - service management, teaching and learning, continuing professional development and research; - use effectively information technology and data processing, storage, retrieval and manipulation in diagnostic imaging; - use computing and information technology to select, analyse, present and communicate radiographic information; Dentistry (2002): Graduating dentists will demonstrate: key transferable skills including information appraisal and technology Medicine (2002): retrieve, manage, and manipulate information by all means, including electronically	Business Administrator L3: Able to update and review databases, record information and produce data analysis where required.	- and data - develop knowledge in coding, classification and terms for clinical health data - explore information mapping in terms of evidence based practice through to supporting decision making - consider what is meant by 'interoperability' in health information technology. Information Intelligence - determine how information can be used for functional intelligence in healthcare - appraise the role of technology in remote care (telehealth) Information Systems - define what is meant by an 'information system' - determine the elements that are included in the framework of information systems - understand the way messages are shared between the Detailed Care Record (DCR) and the Summary Care Record (SCR)

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Key	Subject: Benchmark Statements	Occupation & Level: Competencies/ Skills/ Knowledge/ Behaviour, etc.	Section: Learning Outcomes
	Arts Therapy (2004): confidence in engaging with technology in the pursuit of effective AsTs practice including: a) a working knowledge of the methods commonly used in health care research and the ability to evaluate research papers critically Operating department practice (2004): The award holder should be able to demonstrate the ability to: • access research and literature databases; • use the internet as an information retrieval source; interpret and use data with the aid of technology to enhance the management of care Audiology (2006): use information technology to identify and access information, to record and manage patient data and to process and analyse research findings Optometry (2015): understand the application of information technology to patient management Health Studies (2016): gather and evaluate relevant information from a wide variety of sources, using appropriate manual and digital systems Psychology (2016): • retrieve and organise information effectively • Psychology graduates are familiar with collecting and organising stored information found in library book and journal collections, and online, critically evaluating primary and secondary sources Social Work (2016): Gathering information: graduates in Social Work are able to: i demonstrate persistence in gathering information from a wide range of sources and using a variety of methods, for a range of purposes. These methods include electronic searches, reviews of relevant literature, policy and procedures, face-to-face interviews, and written and telephone contact with individuals and groups Use of technology and numerical skills professional communication, data storage and retrieval and information searching ii accessing and assimilating information to inform working with people		

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HEE (2016)	QAA Benchmark Statements (2001-2017) ¹	Apprenticeship Standards (2015-2016) ¹	Systems of eCare (Sheffield Hallam University, 2009-2017) ¹
Key	Subject: Benchmark Statements	Occupation & Level: Competencies/ Skills/ Knowledge/ Behaviour, etc.	Section: Learning Outcomes
	who use services iii data analysis to enable effective use of research in practice iv retrieve and organise information effectively		Information Future understand your professional role as active participants in future ICT developments where benefit for patients/clients/service users is clear
Creation, innovation, scholarship		Business Administrator L3: - Understands and applies social media solutions appropriately. - Adheres to the organisation's code of conduct for professional use of social media.	The Why, What and Where of eCare - gained an initial understanding to information governance as it affects practice Profession Specific Information Governance - an understanding of the term 'information governance' as it relates to patient / service user / client care - the ability to reflect upon your responsibilities within an information governance framework - the ability to include all aspects of information governance in your practice. Information Systems - demonstrate an understanding of System Security, System Integrity and System Archive.
Digital identity, wellbeing, safety and security	Health Visiting (2001): ability to engage with information management systems and technology relevant to health visiting practice, taking account of policies, procedures and data protection requirements regarding access and confidentiality.	Data Analyst, L4: - the range of data protection and legal issues - interpret and apply the organisations data and information security standards, policies and procedures to data management activities² Senior Healthcare Support Worker, L3: C4. Communication - legislation, policies and local ways of working about handling information; why it is important to record and store information securely and confidentially and support others to do so; e-safety; the audit process and how it relates to your role	The Why, What and Where of eCare - gained an initial understanding to information governance as it affects practice Profession Specific Information Governance - an understanding of the term 'information governance' as it relates to patient / service user / client care - the ability to reflect upon your responsibilities within an information governance framework - the ability to include all aspects of information governance in your practice. Information Systems - demonstrate an understanding of System Security, System Integrity and System Archive.

Table 6a: UK Health & Social Care: Education Standards and Curricula

HEE (2016)	Inform ed - On online introduction to the use of informatics in healthcare (e-Ifh 2013)	IT Skills Pathway
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	Key	Course: Content
Communication, collaboration and participation	Module: Learning Outcomes Introduction to health informatics: Give examples of how health informatics is used in patient care Describe how informatics contributes to many different aspects of health and care services	Entry Level: Digital Literacy Communication Entry Level E-mail Skills SharePoint
Teaching, learning and self-development		Entry Level: Digital Literacy Digital devices Apps, applications and files The Internet Digital Skills Mouse Skills Keyboard Skills Switching On and Off Using Windows Working with Applications File Management Web Skills
Technical proficiency		Entry Level Mouse Skills Keyboard Skills Switching On and Off Using Windows Working with Applications File Management Web Skills Word Processing Office Essentials Office Essentials for the Workplace Working with Microsoft Office applications Text and Text Formatting Working with Files Working with Tables Working with Objects Office Essentials Getting started with programs

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HEE (2016)		Informed - On online introduction to the use of informatics in healthcare (e-Ifh 2013)		IT Skills Pathway
	Key	Module: Learning Outcomes		Course: Content
Information, data and media literacies		Introduction to health informatics Define the term 'health informatics' Describe typical job roles and possible career routes within health informatics Give examples of how health informatics is used in patient care		Word Excel PowerPoint OneNote
		Introduction to health and care Outline the roles of information in preventative care, self-care and health promotion		
		Primary and secondary uses of data in health and care Explain the differences between primary and secondary uses of data Give examples of the types of data used: In the care of patients In public health For management purposes For research For teaching and education Describe some of the risks to the security of patient information and the information governance practices used to mitigate them Explain the main benefits and risks of aggregating data		
		Improving the quality and safety of care through health informatics Explain the principle of evidence-based practice and how this is informed by health research Outline the concepts of clinical governance and audit Explain how informatics can improve the quality and safety of care		
Creation, innovation, scholarship		Introduction to health and care Discuss some of the implications of patients having access to their own records		Entry Level: Digital Literacy Staying safe Entry Level Working Safely
Digital identity, wellbeing, safety and security		Primary and secondary uses of data in health and care Describe some of the risks to the security of patient information and the information governance practices used to mitigate them Improving the quality and safety of care through health informatics List some of the potential risks of using information technology in health care		

Table 7a: Examples of Other Relevant UK Frameworks/Standards/Guidance

HEE (2016)	Digital and information literacy framework (OU, 2012) ¹	Basic Digital Skills framework (Go ON UK, 2015) ¹	Basic Digital Skills Standards (Draft for Consultation) (The Tech Partnership, 2016) ¹
Key	Competence Area: Statement & Level	Area: Responsibility: Skills	Area: Description: Standard
Communication, collaboration and participation	Collaborate and share digital content Understand and engage in digital practices Contribute online information and resources from outside into the activities of the OU study community.	Communicating: Individuals: - Post on forums to connect with communities - Leave feedback on shopping websites and services providers about purchases or experiences Transacting Individuals: Understand and use marketplaces to buy and sell. Order your shopping. Book your travel. Manage your bank account. Set up and manage a Universal Credit account	Communicating effectively a: use digital media to communicate clearly with others b: network and work collaboratively with others Teamwork IT enabled team-working
Teaching, learning and self-development	Understand and engage in digital practices Identify instances of digital technologies being used for the creating and sharing of knowledge in a specific subject area. (L1) Apply digital technologies to managing, recording and reflecting on sustained learning in the subject area. (L3) Demonstrate the ability to create a personal learning environment incorporating elements of OU digital study practices and external applications and environments. (L3)	Problem-solving: Individuals: Teach yourself simple tasks using tutorials. Use feedback from other internet users to solve common problems ; Access support services Creating: Organisations: Create resources to improve employee skill levels	Exploiting technology c: learn new digital skills
Technical proficiency	Understand and engage in digital practices Demonstrate basic use of a range of tools and websites for finding and recording information online: internet browsers, search engines, copy/paste and download functions. (L1)	Managing information: Individuals: - Use a search engine to find the information you need - Bookmark useful websites and services you use often - Store data on a device or in the cloud Communicating: Safety: Use the right security/privacy settings (including parental controls) Individuals:	Increasing productivity b: use digital tools and applications to improve personal and business productivity Implementing technology a: identify, select and set up secure digital systems b: use help and support systems Exploiting technology a: understand how technology is transforming business b: explore features and benefits of technology solutions

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HEE (2016)	Digital and information literacy framework (OU, 2012) ¹	Basic Digital Skills framework (Go ON UK, 2015) ¹	Basic Digital Skills Standards (Draft for Consultation) (The Tech Partnership, 2016) ¹
Key	Competence Area: Statement & Level	Area: Responsibility: Skills	Area: Description: Standard
		Keep in touch using email, instant messaging, video calls and social media Problem-solving: Safety: Use accurate sources of support; avoid malicious websites, scams and pop-up windows	Working online a. navigate and use online systems for a purpose b. set up and maintain online digital resources
	Find information Critically evaluate information, online interactions and online tools Manage and communicate information	Managing information: Safety: Identify and assess accurate information Managing information: Individuals: Search for deals on comparison websites	Managing information Critical Thinking Including: • Observation • Analysis • Interpretation • Reflection • Evaluation • Inference • Explanation • Problem solving • Decision making Increasing productivity a. use software applications to develop and present information
Information, data and media literacies			
	Understand and engage in digital practices Demonstrate the ability to create a personal learning environment incorporating elements of OU digital study practices and external applications and environments. (L3) Articulate the characteristics of digital scholarship in the relevant subject and/or professional area. (Masters)	Creating: Individuals: Create a social media post; Create a text document such as a CV; Create and share a photo album; Create and share feedback about products and services Creating: Organisations: Create an informational or e-commerce website; Create content (pictures, logos, text) to promote your organisation and reach customers	Innovation Including: • Creativity • Entrepreneurship • Generating ideas
Creation, innovation, scholarship			
	Understand and engage in digital practices Articulate principles of legal and ethical behaviour in online contexts. (L2)	Managing information: Safety: • Use security tools when web browsing • Regularly update and run virus software • Manage parental controls Communicating: Safety: Understand how to manage identities	Safety and security e.g., Stay safe and secure when working online
Digital identity, wellbeing, safety and security			

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HEE (2016)	Digital and information literacy framework (OU, 2012) ¹	Basic Digital Skills framework (Go ON UK, 2015) ¹	Basic Digital Skills Standards (Draft for Consultation) (The Tech Partnership, 2016) ¹
Key	Competence Area: Statement & Level	Area: Responsibility: Skills	Area: Description: Standard
		Protect yourself from scams Safety: Transacting: Use secure websites for financial transactions; protect your personal data; respect the privacy of others Creating: Safety: Be aware of copyright law; protect your personal data; respect the privacy of others	

Table 7b: Examples of Other Relevant UK Frameworks/Standards/Guidance

HEE (2016)		Digital and Technology Skills Matrix V. 1.0 (Cabinet Office, 2016) ¹	Skills Framework for the Information Age version 6 (SIFA, 2016) ¹
Key	Skills Group: Skills Title: Skill Description		
Communication, collaboration and participation	Essentials for Digital Specialists: Understanding the Digital transformation EDS 1.6 Understand what we mean by 'digital inclusion' and 'assisted digital' and how we can help all the population use digital services in the future.		Category: Sub-Category: Skill
Teaching, learning and self-development	Essentials for Digital Specialists: Understanding the Digital transformation EDS 1.3 Follow wider digital trends in the industry and how they may impact future government services, for example, the significance of big data, open source tools and Open Document Formats (ODF). Being social media savvy EDS 1.1.2 Be engaged in online communities relevant to your field of work in order to support your work and improve your skills. Digital Leadership: Skills Transformation: DL 10.2 Encourage the implementation of learning interventions that deliver training at pace in a constantly changing technology and digital environment. These should take advantage of formal, informal and social learning utilising digital channels. Digital take-up, digital inclusion and assisted digital DL 12.2 As part of the digital take-up plan, identify and plan for digital inclusion activities, to increase user skills sufficiently to enable independent use of digital services where possible, and plans to retire or downscale traditional contact channels. Performance Analysis: Advances in analytics technologies PER 12.2 Be aware of and keep up to date with advances in digital analytics tools and data manipulation products.		Skills and quality: Skill management: Learning and development management Learning design and development Learning delivery Teaching and subject formation
	Essentials for Digital Specialists: Open standards and open source technologies		Development and Implementation: Systems development: Network design Animation development
	Digital Leadership: Understand digi/tech environment DL 5.2 Work comfortably with a range of digital and technology services and solutions, and have an understanding of how these solutions can be combined to meet user needs, especially in an environment of insourcing and a tower-based approach to technology and digital services.		Installation and integration: Porting/software configuration Hardware design Systems installation/decommissioning
Technical proficiency			

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HEE (2016)	Digital and Technology Skills Matrix V. 1.0 (Cabinet Office, 2016) ¹	Skills Framework for the Information Age version 6 (SIFA, 2016) ¹
Key	Skills Group: Skills Title: Skill Description	Category: Sub-Category: Skill
	Design: Prototyping interfaces in HTML Accessibility Image editing Content Design: Using writing and editing tools Performance Analysis: Performance platform PER 7.2 Use digital analytics packages such as Google Analytics for implementation, administration and analysis: to create an account, set up data views, create dashboards, schedule reports, set up custom reports, custom alerts and manage user permissions so that the team can reliably and easily access appropriate data. PER 7.4 Use digital analytics application programming interfaces (APIs) to extract and manipulate data. Data: Data visualisation for the web: DATA 10.1 Understand front-end web languages like HTML5, Javascript and SVG and some open source visualisation libraries such as d3.js, enabling the production of interactive web-based data visualisations. Languages and statistical analysis softwares: DATA 12.1 Use languages such as HTML5, JQuery, R, Python, Scala, and Java to interrogate data using statistical analysis software. Development: e.g., Understanding of data formats and architectural styles Modular coding Developing to avoid security exploits Server-based Operating Systems Open source technologies Operations Management: Understand both cloud and on-premise QA and Testing: Reading and understanding code	Delivery and operation: Service operation: System software IT Infrastructure Database administration Storage management

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HEE (2016)		Digital and Technology Skills Matrix V. 1.0 (Cabinet Office, 2016) ¹	Skills Framework for the Information Age version 6 (SIFA, 2016) ¹
Key	Skills Group: Skills Title: Skill Description		Category: Sub-Category: Skill
Information, data and media literacies	User Research: - User research techniques - Performance analysis Performance Analysis: - Providing business insight from analysis - User research - Synthesising data - Advances in analytics technologies Data: - Using Big Data Cyber Security and Information Assurance: - Security of Open and Big Data Performance Analysis: - Performance platform PER 7.3 Refine the data output using spreadsheets, pivot tables and other tools such as Google Refine and Tableau. Use these tools to collect, interpret and present data for analysis, enabling user-centric design decisions. Work with digital analytics, financial and user data.		Strategy and architecture: - Information strategy: - Information management - Analytics Business strategy and planning: - Research Technical strategy and planning: - Data management Development and implementation: - Systems development: - Data analysis - Database design
Creation, innovation, scholarship	Digital Leadership: - Understand digi/tech environment - DL 5.4 Monitor the evolving technical landscape and wider digital trends in the industry, such as disruptive innovation, and how they may impact government services or departmental goals. - Social media channel management Development: - Programming languages Content Design: - Platform and media choices Content planning and content strategies CDE 3.2 Understand the implications of publishing content and then appropriately manage the risks of doing so.		Strategy and architecture: - Information strategy: - Information content publishing Technical strategy and planning: - Emerging technology monitoring Development and implementation: - Systems development: - Information content authoring

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HEE (2016)		Digital and Technology Skills Matrix V. 1.0 (Cabinet Office, 2016) ¹	Skills Framework for the Information Age version 6 (SIFA, 2016) ¹
	Key	Skills Group: Skills Title: Skill Description	Category: Sub-Category: Skill
		Turning complex information into easily understood content	
Digital identity, wellbeing, safety and security		Essentials for Digital Specialists Identity Assurance Being social media savvy EDS 1.1.3 Be aware of social media guidance for civil servants and remember three key things when engaging in social media as a civil servant. Learn the rules of each social media space before engaging; Abide by the Civil Service Code and ask for advice if you are not sure; Remember an official account belongs to the Department not the individual Digital Leadership: Risk management: DL 8.2 Advise on the risks associated with cyber security and information assurance and develop strategies to mitigate them. Performance Analysis: Data security and privacy Cyber Security and Information Assurance: Confidentiality, Integrity and Availability	Delivery and operation: Service operation: Security administration Skills and quality: Quality and conformance: Digital forensics

Table 8a: Competencies in the Research Literature

HEE Domains (2016)		Stagers, Gassert, & Curran (2001) ¹			
Key		Categories: Competencies			
Level	1. Beginning Nurse	2. Experienced Nurse	3. Informatics Specialist	4. Informatics Innovator	
Communication, collaboration and participation	Informatics Knowledge: Systems 43. Recognizes the value of clinicians' involvement in the design, selection, implementation, and evaluation of applications and systems in health care Computer Skills: Communication		Informatics Knowledge: Impact 99. Determines the impact of computerized information management on managers and executive roles. Informatics Knowledge: Systems 133. Devises strategies to involve clinicians in the design, selection, implementation, and evaluation of applications and systems in health care. Informatics Skills: Role 230. Consults about informatics with clinical, managerial, educational, and/or research entities. 232. Serves as a liaison among agency departments and vendors. 233. Collaborates with nursing personnel and interdisciplinary teams to accomplish information management work. 240. Acts as a liaison to support communication among providers, patient, and technical communities		
	Computer Skills: Education	Computer Skills: Education	Computer Skills: Simulation	Computer Skills Simulation	
Teaching, learning and self-development	Informatics Knowledge: Impact 34. Recognizes that it takes time, persistent effort, and skill for computers to become an effective tool. 35. Recognizes that health computing will become more common. 36. Recognizes that the computer is only a tool to provide better nursing care and that there are human functions that cannot be performed by computer. 37. Recognizes that one does not have to be a computer programmer to make effective use of the computer in nursing.	Informatics Knowledge: Systems 70. Describes general applications to support nursing education. 71. Discusses CAI as a teaching and learning tool. Informatics Skills: Role 74. Participates in influencing the attitudes of other nurses toward computer use for nursing practice.	Informatics Knowledge: Education Informatics Knowledge: Impact 104. Discusses new careers available to informaticists. 114. Interprets the impact of computerized information management on nursing education. Informatics Knowledge: Systems 130. Discusses general knowledge of computer theory and terminology. 138. Conducts site visits of health information systems in actual use. Informatics Skills: Role 250. Disseminates new knowledge by informing colleagues of new developments and applications in nursing or health care informatics. 251. Contributes to informatics education of students, peers and colleagues. Informatics Skills: Training	Informatics Knowledge: Education Informatics Knowledge: Impact 268. Evaluates the changing role of educator when computerized information management is introduced. Education	

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HEE Domains (2016)		Staggers, Gassett, & Curran (2001) ¹			
	Key	Categories: Competencies			
	Level	1. Beginning Nurse	2. Experienced Nurse	3. Informatics Specialist	4. Informatics Innovator
Technical proficiency		Computer Skills: Administration Computer Skills: Documentation Computer Skills: Monitoring Computer Skills: Basic Desktop Software Computer Skills: Systems Informatics Knowledge: Impact: 38. Describes the computerized or manual paper system that is present. 39. Explains the use of networks for electronic communication (e.g., internet). 40. Identifies the basic components of the current computer system (e.g., features of a personal computer, workstation).	Computer Skills: Basic Desktop Software Informatics Knowledge: Systems Informatics Skills: Systems Maintenance	Computer Skills Basic Desktop Software Computer Skills: Case Tools Computer Skills: Project Management Computer Skills: Systems Informatics Knowledge: Impact 101. Assesses current capabilities and limitations of technology (e.g., data transfer rates, chip capacity). 102. Determines projected impacts to users and organizations when changing to computerized information management. 103. Determines the reasons for slow response time (e.g., heavy demands on computer system at time of shift change). Informatics Knowledge: Systems 120. Explains various input and output devices. 122. Discusses computer fundamentals (e.g., hardware, software, networks, data communications). 124. Evaluates applications/systems available in health care. 126. Interprets capabilities and limitations of hardware, interfaces and their relationship to the outcomes of health computing. 127. Demonstrates extensive knowledge of the applications/systems currently in use. 129. Constructs resources to support users. 134. Discusses current applications available to support clinical care. 135. Recognizes computerized diagnosis equipment (e.g., computed tomography scan, magnetic resonance imaging, digital imaging). 136. Discusses concepts of telemedicine and Internet and their relationship to nursing. 137. Discusses bedside terminals and associated issues, such as use in sterile environments. 140. Interprets the current and projected future state of physiological monitoring. Informatics Knowledge: Usability Informatics Skills: Analysis 149. Applies principles of computing (e.g., reading an algorithm). 150. Analyzes user areas to determine procedural errors versus hardware and software problems. 152. Modifies existing applications, devices to meet changing requirements.	

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HEE Domains (2016)		Staggers, Gassett, & Curran (2001) ¹			
	Key	Categories: Competencies			
	Level	1. Beginning Nurse	2. Experienced Nurse	3. Informatics Specialist	4. Informatics Innovator
				156. Determines problems and impediments in installing computerized information management. Informatics Skills: Implementation Informatics Skills: Programming Informatics Skills: Systems Maintenance Informatics Skills: System Selection Informatics Skills: Testing Computer Skills: Quality Improvement Informatics Knowledge: Data Informatics Knowledge: Impact 106. Discusses the interdependencies computerized information management creates (e.g., changes when doctor enters own orders). 107. Determines the limitations and reliability of computerized patient monitoring systems. 111. Interprets the benefits and risks of computerized information management. 112. Interprets research findings about the impact of computerized information management on clinical practice, educational, administration, and research. 113. Analyzes the impacts of information management technologies on time allocation and tasks of care. Informatics Knowledge: Systems 139. Recommends who generates, owns, and uses nursing and other data. Informatics Skills: Analysis 144. Constructs data elements appropriate to a given practice context. 145. Applies principles and techniques of systems analysis. 147. Analyzes current computerized information and recommends enhancements. 148. Analyzes business practices to determine need for reengineering. 151. Interprets information flow within the organization. 154. Prepares process flow charts to describe current and proposed information flows for all aspects of clinical systems.	Practice 292. Integrates domain knowledge within computerized decision support systems. 293. Analyzes complex issues (e.g., confidentiality, privacy, data security). 294. Recommends policies based on analytical findings. 295. Designs and/or evaluates enterprise-wide strategies for managing the impact of information systems implementation. 296. Designs the structure for complex data sets. 297. Develops new methods of organizing data to enhance research capabilities. 298. Develops innovative methods of data communication, hardware and software integration, and data transformation. 300. Exerts leadership of interdisciplinary teams to provide strategic Information System direction. 301. Influences top-level decisions and policy design which impact clinical information management.
			Computer Skills: Data Access Computer Skills: Decision Support Informatics Knowledge: Data Computer Skills: Data Access Computer Skills: Monitoring Computer Skills: Quality Improvement Computer Skills: Research Informatics Knowledge: Data Informatics Knowledge: Research Informatics Knowledge: Impact 65. Defines the impact of computerized information management on the role of the nurse Informatics Skills: Evaluation		
Information, data and media literacies					

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HEE Domains (2016)		Staggers, Gassett, & Curran (2001) ¹			
Key Level	Categories: Competencies				
	1. Beginning Nurse	2. Experienced Nurse	3. Informatics Specialist	4. Informatics Innovator	
			155. Analyzes organizations to determine policies affecting information flow. 156. Determines problems and impediments in installing computerized information management. Informatics Skills: Data Informatics Skills: Design And Development Informatics Skills: Evaluation		
Creation, innovation, scholarship			Informatics Knowledge: Systems 123. Projects health care computing trends in nursing. 125. Differentiates significant highlights in the evolution of computer technology. 128. Discusses concepts and uses of robotics. Informatics Skills: Role 247. Conducts research to examine impacts of computer technology in nursing. 248. Conducts research to determine application needs in clinical care, education, administration, and research. 249. Conducts research in informatics.	Informatics Skills: Analysis 269. Designs innovative analytic techniques. Informatics Skills: Design And Development 270. Designs unique technology or system alternatives for clinical care, education, administration, and/or research. Research Practice 299. Designs unique system alternatives for clinical care, education, administration or research.	
			Informatics Knowledge: Impact 105. Determines the social, legal, and ethical impacts of changing to computerized information management. Informatics Knowledge: Privacy/Security Informatics Knowledge: Regulations Informatics Skills: Privacy/Security		Practice 293. Analyzes complex issues (e.g., confidentiality, privacy, data security).
Digital identity, wellbeing, safety and security	Informatics Knowledge: Privacy/Security	Informatics Knowledge: Privacy/Security			

Table 8b: Competencies in the Research Literature

HEE Domains (2016)	SMCI Associates (2014) ¹	Whittaker, Hodge, Mares, & Rodney (2015)	Yoon, Shaffer, & Bakken (2015) ¹	van Houwelingen et al (2016) ¹	Yen, Phillips, Kennedy, & Collins (2017) ¹
Key	Core Capabilities: Knowledge/ Skills	Type: Level: Competence	Area: Competency Statement	Competences	Factor: Item
Communication, collaboration and participation	Learning capabilities for the digital age: underpinning domain: - Using online collaboration tools - Participating in video-conferences and webinars - Social networking Using technology to support shared decision- making and self-management: - Technology facilitating co-production and assets-based approaches; supporting self-management; supporting chronic and multiple conditions. - Using technology to find and share evidence and knowledge with colleagues and with service users and carers - Knowledge brokering and health literacy. - Using technology to support making decisions in frontline practice - Using technology to support service users/clients/patients to access and use health and social care resources		Applied computer skills : clinical informatics 15. Act as an advocate of system users including patients and colleagues.	Knowledge of how technology can be used in sharing information with colleagues Uses an ethically correct attitude during videoconferencing (honesty, confidentiality, personal and professional integrity) Promotes the importance of a unified way of analyzing and sharing clinical information to improve the quality of data and the quality of care	Executive planning: 19. Ability to collaborate with CMO peers related to HIT and needs of nurses and physicians
	Learning capabilities for the digital age: underpinning domain: - Accessing online learning opportunities - Using online learning materials	Data management: Level 2: facility-based supervisors: - Organises staff workshops and training sessions related to HIS strengthening Level 3: provincial-/district-level managers - Develops HIS capacity-building	Applied computer skills : clinical informatics 13. Identify, evaluate and use electronic patient education materials appropriate to language and literacy level at the point of care.		Advanced information management and education: 14. Understanding of methods for HIT education 15. Ability to understand technological trends, issues, and new HIT developments because they apply to nursing
Teaching, learning and self-development					

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HEE Domains (2016)	SMCI Associates (2014) ¹	Whittaker, Hodge, Mares, & Rodney (2015)	Yoon, Shaffer, & Bakken (2015) ¹	van Houwelingen et al (2016) ¹	Yen, Phillips, Kennedy, & Collins (2017) ¹
Key	Core Capabilities: Knowledge/ Skills	Type: Level: Competence	Area: Competency Statement	Competences	Factor: Item
		activities across the health system			Executive planning: 17. Ability to define (in collaboration with the IT department) TCO [total cost of ownership] specifically when it relates to the HIT-related cost of staff education and re-education related to upgrades and staff turnover
	Learning capabilities for the digital age: underpinning domain: The basics of using computers	Use of ICT infrastructure: Level 1 : facility-based service providers Level 2: facility-based supervisors: e.g., - Demonstrates basic technology skills (e.g. able to operate computer, print documents, load paper, change toner) - Uses word processing (e.g. Microsoft Word) - Uses spreadsheets (e.g. Microsoft Excel)	Basic computer skills: 1. Demonstrate basic technology skills (e.g. turn computer off and on, load paper, change toner, remove paper jams, print documents). 2. Use e-mail 4. Use applications to manage aggregated data (e.g. excel, database, statistical software). Applied computer skills : clinical informatics 8. Incorporate structured languages into practice (e.g. ICD9 or 10 codes, CPT codes, diagnoses codes). 12. Use application to document patient care. 17. Applies monitoring system appropriately according to the data needed. 18. Describe general applications/systems to support clinical care.	Knowledge about what to do if the technology does not work Encourages the use of electronic measurement devices for the collection of detailed patient information Is able to train the patient to use the Equipment Basic ICT skills, such as the use of the Internet and a personal computer Is able to check equipment for functionality Technological skills in the field of new technology Is able to use electronic health records	Information systems concepts: 24. Ability to understand HIT "work-arounds" and the consequences of human-computer interface interactions:
Technical proficiency	Using technology to share information for integrated person-centred care: - Electronic health and care record structures; - Managing clinical records	Level 3: provincial-/district-level managers: Level 4: national strategic decision-makers: e.g., - Routinely saves and backs up files - Operates virus-scanning processes - Uses presentation graphics (e.g. Excel graphs/PowerPoint) - Uses applications for structured data entry (e.g. patient data, service data)			

Digital Literacy: Competency Mapping Desktop Review

HEE Domains (2016)	SMCI Associates (2014) ¹	Whittaker, Hodge, Mares, & Rodney (2015)	Yoon, Shaffer, & Bakken (2015) ¹	van Houwelingen et al (2016) ¹	Yen, Phillips, Kennedy, & Collins (2017) ¹
Key	Core Capabilities: Knowledge/ Skills	Type: Level: Competence	Area: Competency Statement	Competences	Factor: Item
Information, data and media literacies	Learning capabilities for the digital age: underpinning domain: - Use of search engines - Information management Using technology to share information for integrated person-centred care: - Technical and information standards for data sharing - Core principles of information governance. - Organising information through coding and classification. - Basic data analysis techniques; - Producing and interpreting data visualisation; - Learning from data - generating intelligence for practice, population health and wellbeing and management.	Data generation: Level 1: facility-based service providers - Enters patient data and facility-level health indicators using appropriate forms (in accordance with the national HIS standards) - Performs transcription, analysis, and compilation of data as required by district and/or national health office Level 3: provincial-/district-level managers: - Follows national HIS standards for data management, analysis, and use at provincial/district level - Accesses, processes, and analyses facility level data as per national HIS standards - Extracts data from clinical and public health data sets Data use: Level 2: facility-based supervisors: - Uses data to evaluate service delivery and health outcomes and to improve quality of care at the facility level Level 3: provincial-/district-level managers: - Uses health information in developing the annual budget plan - Uses health information at all levels for managing delivery of the local health service and for continuous monitoring and periodic surveillance and response	Basic computer skills: - Conduct on-line literature searches (e.g. PubMed). Applied computer skills : clinical informatics - Extract data from clinical data sets (e.g. Clinical data warehouse, Minimum Data Set). - Assess accuracy of health information on the Internet. - Identify, evaluate, and apply the most relevant information. - Use decision support systems, expert systems and aids for differential diagnosis. - Participate as a content expert to evaluate information and assist others in developing information structures and systems to promote their area of [discipline name here] practice	Knowledge of how to collect health-related data for patient monitoring Insight into which sources patients like to use to find information about their disease Insight into the reliability of health information on the web Is able to use health-related data effectively in patient care: (a) presents patient data clearly to colleagues (b) is able to measure, compare, group and interpret data Is able to provide advice about reliable health information on the internet; sites, medical care portals and mobile applications	Strategic implementation Management: - Ability to champion the collection, analysis, and trending of nursing data in non-nursing-dominated HIT discussions - Conceptual understanding of the importance of integrating nursing data elements in HIT systems - A conceptual understanding of nursing intervention documentation using HIT, its effect of care delivery, nursing productivity, and secondary use of information. Advanced information management and education: - Conceptual understanding of data quality issues for HIT - Searching information retrieval systems Ethical and legal concepts: - Understanding of ethical principles for collection, maintenance, use, and dissemination of data and information related to HIT

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Key	Core Capabilities: Knowledge/ Skills	Type: Level: Competence	Area: Competency Statement	Competences	Factor: Item
		Level 4: national strategic decision-makers: • Uses health information in national strategic planning and budget development			
Creation, innovation, scholarship	Learning capabilities for the digital age: underpinning domain: • Creating and publishing online content				Information systems concepts: 22. Ability to conceptually understand how to define, design (create a schematic), and implement an HIT solution to achieve overarching nursing workflows
Digital identity, wellbeing, safety and security	Learning capabilities for the digital age: underpinning domain: • Principles of confidentiality and data protection • Internet safety and security • Ethics and responsibility		Applied computer skills : clinical informatics 9. Describe ways to protect data.	Knowledge of the laws and regulations concerning the protection and exchange of medical data, e.g., data protection, informed consent and confidentiality Is able to promote privacy and confidentiality in videoconferencing: Protects the privacy of self and the patient in the use of telehealth technologies (compliance to ethical, legal and regulatory considerations)	Ethical and legal concepts: 20. Understanding of patients rights related to HIT [health information technology] and computerized patient data

Table 9a: International Examples of Frameworks/Standards/Guidance/Curricula

HEE Domains (2016)	European e-Competence Framework (European Committee for Standardization, 2013) ¹	Informatics Competencies for Every Practicing Nurse: Recommendations from the TIGER Collaborative (2014)	Quality and safety education for nurses (QSEN, 2014) ¹	National Informatics Standards for Nurses and Midwives (Australian Nursing and Midwifery Federation, Federal Office, 2015)
Key	Dimension 1: Dimension 2	Category: Standard: Competencies	Area: Knowledge/Skills/Attitudes	Domain: Standard
Communication, collaboration and participation		Basic Computer Competencies: 1.4 ICT in Everyday Life 7.5 Electronic Communication Information Management: Have knowledge of various types of Health Information Systems and their clinical and administrative uses 7.0 Decision Support 9.0 Facilitating Communications	Informatics: Employ communication technologies to coordinate care for patients	
Teaching, learning and self-development	D. Enable: D.3. Education and Training Provision		Informatics: Seek education about how information is managed in care settings before providing care.	
Technical proficiency	A. Plan: - A.5. Architecture Design - A.6. Application Design B. Build: - B.1. Application Development - B.2. Component Integration - B.4. Solution Deployment - B.6. Systems Engineering	Basic Computer Competencies: 1.1 Hardware 1.2 Software 1.3 Networks 2.1 Operating System 2.2 File Management 2.3 Utilities 2.4 Print Management 3.1 Using the Application 7.1 The Internet 7.2 Using the Browser 7.3 Using the Web 7.4 Web Outputs 7.6 Using e-mail 7.7 e-mail Management		1. Computer Literacy: Standard 1. Demonstrates knowledge and skills in computer basics.

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Key	Dimension 1: Dimension 2	Category: Standard: Competencies	Area: Knowledge/Skills/Attitudes	Domain: Standard
Information, data and media literacies	D. Enable D.10. Information and Knowledge Management	Information Literacy: 1. Determine the nature and extent of the information needed 2. Access needed information effectively and efficiently 3. Evaluate information and its sources critically and incorporates selected information into his or her knowledge base and value system 4. Individually or as a member of a group, use information effectively to accomplish a specific purpose 5. Evaluate outcomes of the use of information	Informatics: Identify essential information that must be available in a common database to support patient care Use information management tools to monitor outcomes of care processes Use high quality electronic sources of healthcare information	2. Information Literacy: Standard 2: Effectively and efficiently identifies and finds information to support evidence-based practice. Standard 3: Critically evaluates information gathered. Standard 4: Manages information collected or generated. 3. Information Management: Standard 5: Demonstrates collection, use and management of data and information to support decision-making in practice. Standard 6: Demonstrates understanding of the purpose, basic structures, use and storage of electronic health records. Standard 7: Understands the concepts, scope and practice of a variety of information and communication technologies that support health and aged care. Standard 9: Demonstrates the ability to use information communication technologies to promote safe, effective use of information to support nursing and midwifery practice. Standard 10: Demonstrates the ability to include research, evidence-based practice and quality improvements in supporting the use of information and communication technologies.
Creation, innovation, scholarship	A Plan: A.7. Technology Trend Monitoring A.9. Innovating			

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Key	Dimension 1: Dimension 2	Category: Standard: Competencies	Area: Knowledge/Skills/Attitudes	Domain: Standard
Digital identity, wellbeing, safety and security	D. Enable: D.1. Information Security Strategy Development E. Manage E.8. Information Security Management	Information Management: Assure Confidentiality of protected patient health information when using Health Information Systems under his or her control Assure Access Control in the use of Health Information Systems under his or her control Assure the Security of Health Information Systems under his or her control Basic Computer Competencies: 1.5 Security 1.6 Law	Safety: Demonstrate effective use of technology and standardized practices that support safety and quality Informatics: Apply technology and information management tools to support safe processes of care Protect confidentiality of protected health information in electronic health records	3. Information Management: Standard 8: Complies with the legal and regulatory requirements, and ethical principles, for all uses of information and communication technologies used in nursing and midwifery practice.

Table 9b: International Examples of Frameworks/Standards/Guidance/Curricula

HEE (2016)	European Computer Driving Licence (ECDL Foundation, 2007 - 2015) ¹	DIGCOMP 2.0 (Vuorikari, Punie, Carretero, & Van den Brande, 2016) ¹	HITCOMP (2017) ¹
Key	Module (Level): Goals	Competences Areas: Competences	Area of Competency: Competency examples
Communication, collaboration and participation	Online Essentials (Base): Understand concepts of online communities, communications and e-mail. Online Collaboration (Intermediate):	2. Communication and collaboration: 5. Problem solving:	Care Coordination: BA01 Contribute to the integration of health information exchanges and telehealth to improve care coordination between acute care and other providers, improve care transitions, increase access to specialist treatment and support regional models of service delivery BN02 Use health information systems to coordinate patient care per your role Clinical Practice & Workflows: DA04 Collaboratively work to define the context within which clinical information and evidence is needed and used by patients, clinicians, policy makers, developers of guidance and the public DA08 Encourage integration of telehealth into eHealth/health IT initiatives to empower patients with long term conditions to manage their own condition, avoid unnecessary hospital admissions, provide support for both patients and caregivers, and provider greater access to specialist services Communication & Change Management: FA09 Identify the barriers to successful informatics-enabled change and analyze how each barrier might be tackled or prevented through the use of effective change management techniques and good practice FN09 Utilize or encourage the use of health information exchanges and telehealth to improve communication between care providers, staff and patients HIE/Interoperability/Interfaces/Integration: KL02 Understand how health information exchanges and telehealth can improve communication between providers Medications & Allergies: MB03 Understand how technology affects the medication prescribing, delivery and administration process MN02 Illustrate the role a complete medication record plays across the care continuum, including primary and secondary care Patient Access & Engagement/PHRs: OL03 Understand how health IT/Health can support safe, effective, person-centered care and patient engagement as related to your role Systems Development and Implementation: EEA11 Engage with colleagues to assess organizational readiness for systems implementation in terms of attitudes, computer literacy, hardware and infrastructure eHealth/mHealth/Telehealth: IA03 Evaluate the implications of collaborative and virtual working for the storage, finding and exchange of

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HEE (2016)	European Computer Driving Licence (ECDL Foundation, 2007 - 2015) ¹	DIGCOMP 2.0 (Vuorikari, Punie, Carretero, & Van den Brande, 2016) ¹	HITCOMP (2017) ¹
Key	Module (Level): Goals	Competences Areas: Competences	Area of Competency: Competency examples
			information
Teaching, learning and self-development		5. Problem solving: 5.4 Identifying digital competence gaps	Administration/General Mgmt/Governance: VA07 For administrative, legal, financial and management personnel in HIT/eHealth/health informatics, coach and/ or mentor individuals and teams to address learning needs VA08 For administrative, legal, financial and management personnel in HIT/eHealth/health informatics, diagnose individual and group competence, identifying skill needs and skill gaps General HIT Knowledge/System Use: JL02 Be able to use, and assist others in using, technology as a reference or educational tool JL12 Use eLearning products to enhance personal professional development Informatics Process: FFE04 Critically analyze and stay up-to-date on informatics literature relevant to your current role Patient Access & Engagement/PHRs: OE03 Develop and promote programs that enable patients to participate in their healthcare through electronic means, and which empower them to become more active participants in their care, more educated about their diseases and health conditions, and better prepared to develop and implement action plans for health behavior change Quality & Safety: TE08 Promote, train and educate the team regarding policies and procedures to ensure quality and safety Standards and Protocols: DDN10 Maintain up to date knowledge of developments in the eHealth standards domain
Technical proficiency	Computer Essentials (Base): e.g., - Understand key concepts relating to ICT, computers, devices and software. - Start up and shut down a computer. - Work effectively on the computer desktop using icons, windows. - Adjust the main operating system	4. Safety: 4.1 Protecting devices 5. Problem solving: 5.1 Solving technical problems	Clinical Decision Support & Pathway: CA05 Lead the process of implementing, evaluating and maintaining clinical decision support tools CN05 Distinguish the points of intersection between ePrescribing systems, electronic ordering, and clinical decision support systems CN06 Identify and articulate the appropriate input mechanisms for users of clinical decision support (i.e. physicians want alerts, patient wants a pop up confirmation screen) Clinical Practice & Workflows: DN04 Implement necessary IT changes to ensure clinical workflow processes can be achieved

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Key	Module (Level): Goals	Competences Areas: Competences	Area of Competency: Competency examples
	settings and use built-in help features. Online Essentials (Base): e.g., • Use the web browser and manage browser settings, bookmarks, web outputs. • Send, receive e-mails and manage e-mail settings. Word Processing (Base/Advanced): Spreadsheets (Base/Advanced): Presentation (Intermediate/Advanced): Using Databases (Intermediate/Advanced):² IT Security (Intermediate):		Area of Competency: Competency examples DN05 Integrate healthcare and mobile technologies, including patient-utilized and telehealth technologies, into health IT/eHealth systems, to support viewing, transferring, exchange and recording of clinical information at various care points and with different constituents of the health partnership, including patients, care-givers, referrers and others Documentation Process: HL03 Enter data into computer and technology devices quickly, with an acceptable degree of accuracy HL04 Use word processing programs to create, edit, store, and retrieve document files General HIT Knowledge/System Use: JB11 Understand and efficiently use basic computer hardware (e.g., input devices, printers) and software (e.g. electronic health record, Office programs) to perform tasks related to your role Jl06 Identify and be able to use icons, cursors, windows, menus and other device navigational tools HIE/Interoperability/Interfaces/Integration: KA05 Integrate health IT/eHealth systems with other systems where appropriate such as departmental, radiology, laboratory systems, etc., and lead the development and approval processes for the methods for transferring data and messages between systems Information and Communications Technology/Information Systems/IT: GGA04 Develop plans and procedures for versioning, withdrawing, replacing, retiring or sunsetting information systems in healthcare GGA07 Lead software and hardware engineering functions for your organization, depending upon your role Issue Management & Resolution: LB06 Perform health IT/eHealth and related system diagnostics and maintenance, per your job role Patient Centered Interactions/Patient Identification: SN02 Identify the capabilities of personal health technology devices, such as tablets and mobile phones, to support interaction with the electronic health record at the point of care Standards and Protocols: DDA05 Develop protocols for data encryption and digital signature DDB06 Explain the role of technical standards and how those standards support syntactic and semantic interoperability Systems Development and Implementation: EEA09 Develop and conduct user, device, network load, and other environmental scans and surveys in healthcare settings to aid in the selection, purchase and implementation of health information technology

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Key	Module (Level): Goals	Competences Areas: Competences	Area of Competency: Competency examples	
Information, data and media literacies	Online Essentials (Base): - Understand key copyright and data protection issues. - Search effectively for online information and critically evaluate web content. Health Information Systems Usage (Intermediate): Information Literacy (Intermediate):	1. Information and data literacy:	and electronic health systems EEN08 Code, debug, test, document and communicate product development stages, validating results with user representatives eHealth/mHealth/Telehealth: IL01 Be familiar with basic email functions (including, replying to/forwarding messages, using electronic address books, attaching files, etc.), and comply with organizational email policies and procedures Access to Information/PHI/Health Info Management: e.g. AA01 Create, manage and utilize policies for accessing, collecting, entering, retrieval and storage of patient data, including single-sign on, remote record access, access pertaining to "scribes", and other data access issues, as part of the appropriate care management team AB01 Be familiar with the concepts of primary and secondary uses of health data Administration/General Mgmt/Governance: e.g. VA01 Apply information management principles and best practices VA10 Manage information systems in healthcare (health information management, strategic and tactical information management, informatics governance, informatics service management, and legal and regulatory issues) Business Process Design/Workflows: WB01 Describe how data, information, and knowledge flow within the health system as per your role in research and biomedicine/emerging medical technology Clinical Practice & Workflows: DN02 Describe the flow of data, information and knowledge within the health system Collection of Data/Knowledge Mgmt (Library): AAE05 Plan and direct knowledge mapping and audit activities AAN01 Be able to apply or check research metadata to ensure it accurately describes the data item and its provenance Coding & Terminologies: EB04 Identify terms and keywords used to search for clinical information and evidence and how to use controlled vocabularies Data Compiling, Analysis, Modeling & Reporting: GA02 Assess the key attributes of data and information and their limitations within the context of intended use GA05 Interpret health information derived from individual data items Informatics Process: FB01 Explain the benefits and challenges of informatics	

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Key	Module (Level): Goals	Competences Areas: Competences	Area of Competency: Competency examples	
			FFA02 Manage informatics processes methodically, including analysis, alerting and decision support, so that sources can be cited and procedures duplicated or modified if needed Information and Communications Technology/Information Systems/IT: GGN02 Demonstrate data manipulation techniques (e.g. querying, SQL, reporting) Patient Access & Engagement/PHRs: ON01 Advise patients on good quality sources of information and education, and be able to direct patients to librarians and other information specialists Population Management/Public Health: QN03 Collect and use health IT/eHealth data for research into populations and their management (i.e., epidemiology) QN05 Compute determinants such as class descriptors, rank, score, occurrence, etc. in research using health IT/eHealth Quality & Safety: TB01 Be aware of dashboards, key indicator metrics, performance reports and other methods of quality assurance and control that may be useful in research and biomedicine initiatives Research/Biomed: CCA10 Promotes an information culture by encouraging and facilitating appropriate uses of information and knowledge, especially in areas of research and biomedicine/emerging medical technology Risk & Compliance: YN03 Be able to discuss potential risks relating to data and information with colleagues and relevant others within the context of your work	Administration/General Mgmt/Governance: VE08 Lead the process of identifying best practices in IT enabled change General HIT Knowledge/System Use: JA02 Assess emerging technologies as part of a strategic health IT plan based on your institution JN07 Identify where Web technologies may be relevant to current or future healthcare Research/Biomed: CCA09 Pose innovative and important health service research questions, informed by systematic reviews of the literature, stakeholder needs, and relevant theoretical and conceptual models aligned with health IT/eHealth
	Image Editing (Intermediate): Web Editing (Intermediate): 2D CAD (Intermediate): Computing (Intermediate): Understand key concepts relating to computing and the typical activities involved in creating a program.	3. Digital content creation: 3.3 Copyright and licences 3.4 Programming 5. Problem solving: 5.3 Creatively using digital technologies		
Creation, innovation, scholarship				

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Key	Module (Level): Goals	Competences Areas: Competences	Area of Competency: Competency examples
Digital identity, wellbeing, safety and security	IT Security (Intermediate): - Recognise threats to personal security from identity theft and potential threats to data from using cloud computing - Understand communication security issues that can arise from using e-mail, social networks, voice over Internet protocol, instant messaging and mobile devices.	2. Communication and collaboration: 2.6 Managing digital identity 4. Safety:	Access to Information/PHI/Health Info Management: AL04 Understand the concepts of "single-sign on", activating a patient's record, and the safety precautions that need to be observed when working with multiple open applications or records simultaneously AN05 Understand the implications of Information Governance and terms such as "Subject Access Request" on health IT/eHealth in research areas Administration/General Mgmt/Governance: VA11 Participate in the development of strong and sound user identification and password policies for your organization VE05 From an administrative and legal perspective, identify, quantify and manage the range of threats to electronic health information in the organization, according to your job role Clinical Decision Support & Pathway: CN17 Understand the legal, ethical and regulatory issues as related to clinical decision support Confidentiality/Protected Health Information/Records Mgmt: UL02 Relate the importance of confidentiality when working with any patient information, sensitive organizational data, or health IT/eHealth records, including protected health information Legal: XE03 Evaluate and convey to others the implications of current professional, ethical, and legal obligations and guidelines related to health information and technology/eHealth Patient Access & Engagement/PHRs: OA02 Ensure patients, caregivers and family know how to access information to inform their health and care and where they can go for help and support Patient Centered Interactions/Patient Identification: SE01 Advance, evaluate and enforce organizational and regulatory requirements related to patient identification and demographics Privacy & Security: RA03 Ensure application of interdisciplinary, interdepartmental and organizational confidentiality, security and privacy policies and procedures regarding networks, electronic health information, and other health IT/eHealth and information systems RL01 Be familiar with ethical and security issues including accountability of staff, healthcare providers and managers and the confidentiality, privacy and security of patient data

Appendix 4: Other Sector Frameworks

A selection of other sector frameworks, standards, guidance for digital literacy capabilities are described here to enable a comparison against health and social care focused sources.

A: UK Other Sector Competence Frameworks

i) Digital and Information Literacy Framework (The Open University, 2012)

This framework is an example of the digital literacy approaches being developed by Higher Education Institutions to underpin strategy and curriculum development. Another example is the Jisc Framework (Jisc, 2015) that forms the basis of the HEE Digital Literacies definition. The OU framework covers 5 areas: Understand and engage in digital practices; Find information; Critically evaluate information, online interactions and online tools; Manage and communicate information and Collaborate and share digital content. These areas have been divided into 5 levels/stages: Access / level 0; Foundation digital practice stage / level 1; Interactive and co-operative digital practice stage / level 2; Personalised and collaborative digital practice stage / level 3 and Professional and digital identity stage / masters. Basic digital skills have been specifically excluded as it is assumed that students will already have these or quickly acquire them on starting University.

ii) Basic Digital Skills Framework (Go ON UK, 2015)

This framework, aimed at UK citizens was developed to identify the minimum level of digital skills needed to navigate and use the internet safely. It covers 5 areas: managing information, communicating, transacting, problem-solving and creating. It is task focused and identifies the skills needed by individuals and organisations. Safety and security is highlighted separately across all 5 themes.

iii) Skills Framework for the Information Age version 6 (SFIA Foundation, 2015)

The SIFA framework is aimed at IT Specialists in Information Systems roles (SFIA Foundation, 2015). It describes 97 ICT skills across 7 levels of proficiency, essentially from novice to expert identifying the levels of autonomy, influence, complexity and business skills a role requires. The SIFA is no longer the mandated skills framework in UK government (National Audit Office, 2015).

iv) Digital and Technology Skills Matrix v1.0 (Cabinet Office, 2016)

The skills matrix was developed as part of the UK Governments programme of Civil Service Reform. The matrix identifies “*the skills needed to create, maintain and improve digital services and information*” and is aimed at specialist IT roles within the civil service. The extensive matrix covers 18 skills groups including: Digital Specialist; Digital Leadership: Content Design and Data.

The matrix is designed to support Government Departments/ Organisations to identify the skills needed and individuals the skills they may need to develop. The matrix mapped against all 6 HEE Digital Literacies domains.

v) Basic Digital Skills Standards (Draft for Consultation) (The Tech Partnership Ltd, 2016)

The Tech Partnership is the successor organisation to GoON UK and Doteveryone. It is working to improve the standards of digital skills in the workforce, and has responsibility for digital apprenticeships and National Occupational Standards. In 2016, Tech Partnership were asked by the UK Government to develop standards for basic digital skills. A consultation process was held in 2016 and the feedback is under review. The draft consultation paper divides the standards into Technical Competence and Behavioural/ transferable competence areas. The categories for technical competence are:

1. Safety and security
2. Managing information
3. Increasing productivity
4. Exploiting technology
5. Implementing technology
6. Communicating effectively
7. Working on-line

Categories for transferable competence are:

1. Critical thinking
2. Innovation
3. Employability
4. Business awareness
5. Responsibility
6. Teamwork

B. International Examples of Other Sector Competence Frameworks

i) European e-Competence Framework (European Committee for Standardization, 2013)

This European framework (e-CF) is aimed at ICT professionals across all business sectors. It contains 40 capabilities reflecting different areas of business activity, HR and strategic planning. Each area has up to 5 levels of proficiency and gives examples of the knowledge and skills required for each competency. It has been suggested though that the framework is only at a basic level and not suited to more specialist ICT roles (Babinet, et al., 2014).

ii). DigComp 2.0: The Digital Competence Framework for Citizens (Vuorikari, Punie, Carretero, & Van den Brande, 2016)

DigComp 1.0 (Ferrari, 2013) was developed as part of the EU programme for lifelong learning. It is being reviewed and revised to reflect new terminology; address online safety and also to emphasise digital technologies. The framework contains 5 core areas: Information; Communication; Content Creation; Safety and Problem Solving. Each area has a number of capabilities with proficiency levels and associated knowledge skills and attitudes.

iii) eCDL (ECDL Foundation)

The eCDL (ECDL Foundation) is a Europe wide programme offering courses to address IT skills across all sectors. It has been mapped against the DigComp Framework 2.0. Previously, it has been used in the NHS, however from 2008 it was no longer supported by the NHS and has been replaced by the NHS Skills Pathway (Embedding Informatics in Clinical Education (eICE), 2012).

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Appendix 5: Definition Comparisons

“Digital literacies are the capabilities which fit someone for living, learning, working, participating and thriving in a digital society” (HEE 2016)

Staggers & Gassert (2000, p306)	“...the integration of knowledge, skills, and attitudes in the performance of various nursing informatics activities within prescribed levels of nursing practice”	Academy of Medical Royal Colleges, (2011, p9)	“eHealth describes the use of electronic communication and information technology to improve the access, efficiency, effectiveness and quality of clinical and business processes utilised by healthcare organisations, healthcare professionals and patients. This includes the collection, use and sharing of information to support the delivery of healthcare.”	The Open University (2012, p3)	“Digital literacy includes the ability to find and use information (otherwise known as information literacy) but goes beyond this to encompass communication, collaboration and teamwork, social awareness in the digital environment, understanding of e-safety and creation of new information. Both digital and information literacy are underpinned by critical thinking and evaluation.”	Ferrari (DIGCOMP 1.0) (2013, p2)	“Digital Competence can be broadly defined as the confident, critical and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society”	The TIGER Initiative (2014)	“the integration of nursing science, computer and information science, and cognitive science to manage communication and expand the data, information, knowledge, and wisdom of nursing practice”
Royal College of Nursing (2014, p5)	“...it is the digital awareness, behaviour and sense of wellbeing that young people have that will ultimately ensure that they have the knowledge and resilience to keep themselves safe online.”	QSEN Institute (2014)	1. “Use information and technology to communicate, manage knowledge, mitigate error, and support decision making”	Skills for Care and Development (2014, p2)	“As e-AT becomes part of the way individuals are supported, it is therefore essential that social care workers become confident, knowledgeable and skilful about technology and the contribution it can make. This means not only knowing how a particular piece of equipment works, but also what it helps the individual to achieve and why that's important.”	SFIA Foundation (2015)	“...describes skills required by professionals in roles involving information and communications technology.”	Australian Nursing and Midwifery Federation, Federal Office (2015, p2)	“Computer literacy is the ability to transmit, investigate, share, and create knowledge, and critically reason with a computer.” “Information Literacy is an understanding and set of abilities enabling individuals to 'recognise when information is needed, and have the capacity to locate, evaluate, and use effectively the needed information.”

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Skills for Care (2016, p4)	The Tech Partnership Ltd (2016, p1)	ECDL Foundation (2017)	NMC (2017, p34)
"Core digital skills are the skills and knowledge needed to undertake everyday digital activities relevant to your job role. This can include finding and managing digital information, sharing personal data digitally, using digital technology and making use of e-learning. It may involve using a personal computer, laptop, tablet or phone."	"The 2012 Royal Society report defines Digital Literacy as: "The ability to use computer systems confidently and effectively - The use of the Internet, including browsing, searching and creating content for the web and communication and collaboration via e-mail, social networks, and collaborative workspace and discussion forums"	In summary, we can say that digital literacy encompasses: • The knowledge and skills required to participate in essential ICT user activities Digital competence, in turn, encompasses: • The knowledge and skills required to use ICT competently in a particular social, educational, or work context	Digital literacy: the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills. Digital technologies: the ability to use computers and computer based tools to solve problems and to enter, share, and search for information from a variety of sources.

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