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WP6 - Enhancing Continuity of Care

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To explore how common standards or frameworks can be exploited to develop the e-skills of current health professionals.

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Acronyms and Abbreviations

Acronym	Description
CPD	Continuous professional development
eHAction	eHAction – 3 rd Joint Action supporting the eHealth Network
eHMSEG	eHealth Member State Expert Group
eHN	eHealth Network
EMR	Electronic Medical Record
EU	European Union
HP	Health professional
ICT	Information and Communications Technology
MS	Member State
MWP	Multiannual Work Programme
WP	Work package

Executive Summary

This is the final report on Task 6.3 'e-Skills for Professionals' which explores how e-skills competence frameworks may be used to assess and develop the e-skills of health professionals in a consistent and objective way, identifying skills gaps and developing those skills to achieve a desired objective. Is it possible to embed the use of competence frameworks in this way into the continuous professional development of health professionals?

The focus is on five EU-recognised categories of practising health professionals: doctors, nurses, midwives, dentists and pharmacists, and the task concentrates on using an e-skills competence framework in a competency-based approach to workforce development.

Competence frameworks can act as a common language to describe the knowledge and skills required for a role, in an organisation or across a sector, such as the European e-competence framework for ICT professionals. The use of competence frameworks can have benefits for the individual and the employer. The eHealth competence model was developed during a previous joint action to define the e-skills competence of professionals in healthcare.

A pilot was conducted during Task 6.3. The pilot asked health professionals to self-assess their e-skills competence against the eHealth competence model before providing feedback. Participants selected seven competences on average, mainly relating to the 'USE' category of competences. The majority of pilot participants gave positive feedback about the importance of e-skills in the survey section of the pilot, but opinions were mixed on the self-assessment framework and online tool that was used. A majority of respondents would recommend a competence self-assessment exercise to a friend, colleague or manager.

In addition, eighteen stakeholders in six countries were interviewed to validate the pilot results and gauge their views on the usefulness of the framework approach in the eHealth domain. Their feedback was mixed on the practical implementation of competence frameworks and training approaches but consistent on motivational issues and the need to develop the e-skills and health informatics knowledge of health professionals.

According to two recent surveys of European medical and pharmacy students, there is a gap between the overall positive attitude of students towards digital technologies and their lack of digital health literacy and the insufficient practical training they receive.

A self-assessment exercise such as that presented to health professionals in the pilot, measuring their e-skills against a validated, relevant and easy-to-use competence framework can have value before certain interventions such as new system implementations and annual reviews. Educational institutions, organisations and individual health professionals can benefit from using a competence framework as a common language to reference 'real-world' e-skills requirements, independent of supplier-led training. A competence-based approach can help to develop a common standard of e-skills expertise for health professionals in the future, supporting the implementation of such skills in health science curricula and in continuous professional development initiatives, as well as monitor and evaluate the process.

The issue of e-skills for health professionals is garnering increased interest from all relevant stakeholders in health and although we were unable to find a practical implementation of an e-skills competence framework upon which to model a roadmap or methodology we conclude that competence frameworks can have value when applied in educational and organisational settings,

particularly because it can be used to map training interventions to particular needs. To sustain the work initiated in this task, further validation of the framework could be carried out by putting greater numbers through the competence self-assessment exercise or conducting a more comprehensive pilot, including competence mapping, training and assessment in a healthcare organisation; the eHealth Competence Model could be revised or further research into best practices in Member States carried out.

Section 1 – Introduction

The stated aim of Task 6.3 of eHAction 'e-Skills for Professionals' is to provide a clear understanding of how common standards or frameworks can be exploited as part of a structured methodology to develop the e-skills necessary to support eHealth in Member States/countries amongst designated professional groupings in healthcare.

This statement may be broken down into further aspects for consideration:

- Is there a common standard or competence framework that specifies the e-skills needed by health professionals to perform their current roles and take advantage of the digitalisation of healthcare?
- Is there a way of using such a competence framework to measure current and desired e-skills competence and identify gaps at individual, group or organisational level?
- Can e-skills competences be mapped to learning outcomes that form the basis of an action plan for e-skills development?
- Can an e-skills competence framework serve as a structure upon which to define learning outcomes and write training curricula in health science educational institutions and organisational settings?
- Can the use of competence frameworks as described above be incorporated into the continuous professional development of health professionals?

The output of Task 6.3 attempts to address these questions by outlining an approach to equipping health professionals with the e-skills they require. The wider audience for the report includes the eHMSEG, health ministries and agencies of Member States/countries, the European Commission and other eHealth stakeholders such as academics, clinicians and professional bodies. In particular, the report can support Member States/eHMSEG in developing a process to ensure the availability of e-skills necessary for the implementation of European eHealth strategies and cross-border healthcare services. Two information notes detailing the Task 6.3 project plan were submitted to the eHealth Network in November 2018 and April 2019 and a draft report submitted in November 2019 for information.

This document is the final report deliverable:

- The next section in this report provides background on the topic of e-skills for health professionals and clarifies the scope of Task 6.3.
- In section 3, a competence-based approach to workforce development is explored, building from the way in which a single competence may be described to the construction of a competence framework that can be used to the benefit of the organisation and the individual. A select number of e-skills competence frameworks in the health domain are examined and the eHealth Competence Model is introduced.
- An overview of the approach taken in Task 6.3 is provided in section 4, i.e. a pilot of the eHealth competence model and consultations with relevant stakeholders to validate the pilot results and gauge their views on the usefulness of the framework approach in the eHealth domain. A summary of results follows in section 5.

- Section 6 gives the perspectives of medical and pharmacy students.
- Reflections on the task and lessons learned are described in section 8.
- Concluding thoughts are drawn in section 8, considering the sustainability of this work in the future.
- The appendices provide further details of pilot results and interviews.

Section 2 – Background and Scope

According to the eHealth Stakeholder Group, a European Commission advisory body, in its report on e-skills workforce¹, ‘the healthcare workforce is crucial in the wider deployment of eHealth. First, they are the primary users of eHealth. Plus, they also accompany patients in using these technologies appropriately, providing reassurance. Supporting the digital skills of the health workforce is all the more needed in view of the constant changing nature of healthcare systems and healthcare delivery’.

In 2012, an international survey by the OECD called the Programme for the International Assessment of Adult Competencies (PIAAC)² measured adult key cognitive and workplace skills. The results, when analysed on a sectoral basis, suggested an ICT and problem solving skills mismatch in health workers. The PIAAC survey will be conducted again in 2020.

Member States are in varying stages of implementing patient access to electronic health records³. A HIMSS Analytics Annual European Health Survey 2018⁴ key finding was that electronic medical record (EMR) implementation remains a priority focus of healthcare providers concluding that: ‘Once a country has reached a certain level of EMR-maturity, priorities shift towards patient empowerment.’

The digitalisation of healthcare is ongoing but increasing in pace, requiring the current healthcare workforce to take advantage of available technological innovations that improve patient outcomes, optimise efficiency and generally bring about a digital transformation of health services. Performance, competence and continuous professional development of the healthcare workforce must be catered for in this context, with digital and professional ICT skills taking their place alongside clinical competence.

In 2016 the European Parliament’s Committee on Digital Skills for Health Professionals⁵ surveyed over 200 health professionals and found that a vast majority felt insufficiently trained to deal with the digital revolution. The report recommended a joint action on digital skills for health professionals to agree key issues and determine a common approach.

At the European Deans’ Meeting ‘Training Future-Proof Doctors for the Digital Society’ on April 12 2019 in Rotterdam, participants developed a set of principles and recommendations and committed themselves to take them forward in their own medical curricula and to continue promoting them among policy-makers. The key message: digital knowledge, skills and competences shall become a new core component of training for future and current doctors⁶.

The eHealth Network Multiannual Work Programme 2018 – 2021⁷, priority area ‘D: Overcoming Implementation Challenges’, includes a topic on e-skills for professionals which has led to the

¹ <https://ec.europa.eu/digital-single-market/en/news/health-professionals-it-time-upgrade-your-eskills>

² PIAAC data <http://www.oecd.org/skills/piaac/>

³ JaseHN Final Report on EU state of play on patient access on eHealth data, 2017.

⁴ <https://www.himss.eu/himss-analytics-annual-european-ehealth-survey-2018>

⁵ <https://www.healthparliament.eu/digital-skills-health-professionals/>

⁶ <https://ec.europa.eu/digital-single-market/en/news/digital-transforming-medical-doctors-daily-work-deans-and-student-doctors-agree-common>

⁷ https://ec.europa.eu/health/sites/health/files/ehealth/docs/ev_20171128_co01_en.pdf

formulation of Task 6.3, as introduced in the previous section. The European Commission is investigating whether to propose an adaptation of the minimum knowledge, skills and training subjects for the nursing profession responsible for general care under Directive 2005/36/EC ('Recognition of professional qualifications in practice') reflecting technological advancements including eHealth.

Task 6.3 focuses on using frameworks in a competence-based approach to workforce development. A competence-based approach is particularly applicable to the assessment and acquisition of concrete skills, such as e-skills in this case, over abstract learning. The task team were unable to find a practical implementation of such an e-skills competence framework in a health setting that might feed into good practice guidelines or form the basis of a template 'roadmap' mentioned in the task description. Instead, the benefits of competence frameworks for the individual and the organisation are provided along with an illustrative example of how a competence framework might be used in practice.

The scope of Task 6.3 covers current, practising health professionals, specifically five EU-recognised categories of health professionals⁸: doctors, nurses, midwives, dentists and pharmacists. This document also refers to the essential role of health science education, and thus of the faculties, in preparing future health professionals for the digital transformation of the healthcare system.

⁸ https://ec.europa.eu/growth/single-market/services/free-movement-professionals/qualifications-recognition_en

Section 3 – A Competence-Based Approach to Workforce Development

In the workplace, each individual role has its own set of competences (skills, knowledge and attributes) needed to perform the job effectively. The European e-competence framework⁹ defines competence as ‘a demonstrated ability to apply knowledge, skills and attitudes for achieving observable results’.

Competences across multiple roles are often brought together, in a structured way, in competence frameworks. A competence framework can be used to clearly define an individual’s personal competence profile as well as development objectives. It can be a consistent measuring tool for use across organisations, sectors and geographical boundaries.

Competence Frameworks can be:

- Developed internally within an organisation.
- Cover a sector or profession.
- Define skills across sectors or geographical boundaries, e.g. DigComp 2.1, the Digital competence framework for citizens¹⁰.
- Cover a very specific activity, e.g. the EU Competency Framework for the management and implementation of the European Regional Development Fund¹¹.

A competence framework typically consists of a set of competences grouped by relevant criteria like business processes or stages in a patient's journey. Categories can be arbitrary and usually serve as navigation aids for users.

Each competence in a framework typically belongs to a category and has a name or title and description or definition:

Competence Name	Description
Electronic Health Information Usage, Exchange and Sharing.	Shares electronically patient health information guaranteeing safety and privacy requirements. Uses electronic health information for secondary purposes with patients’ consent.

Figure 1 A Competence Example

Competences are then usually defined in a series of levels, increasing in complexity and autonomy. Key behaviours or examples of observable actions are expressed at each level.

⁹ European e-competence Framework (EN 16234-1:2016). 2016. Available at: <http://www.ecompetences.eu/>

¹⁰ <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/digcomp-21-digital-competence-framework-citizens-eight-proficiency-levels-and-examples-use>

¹¹ https://ec.europa.eu/regional_policy/sources/policy/how/improving-investment/competency/eu_competency_framework_en.pdf

Level	Key Proficiency
e-2	Sends and receives electronic health data, obeying best practices of transfer of information in a secure way. Uses appropriate electronic health information for daily tasks.
e-3	Monitors and provides guidance on the usage and sharing process of electronic health record data. Contributes to the development of best practices.
e-4	Leads development of policies for the electronic information sharing and usage in accordance with national guidance and relevant legislation.

Figure 2 Examples of Competence Levels

Competences can be selected, arranged and grouped into distinct profiles that relate to a 'business role' that may or may not be the same as a 'job description'.

Competence frameworks provide a structure or scaffold on which to:

- Set expectations around skills required for a role,
- Diagnose the skills of a particular cohort of individuals in a consistent and objective way, and
- Identify skills gaps and develop those skills to achieve a desired objective.

Therefore, using competence frameworks can benefit both the individual and the organisation (see Figure 3).

Benefits for the Organisation	Benefits for the Individual
Set clear expectations about performance expectations.	Gain an insight into overall strategy of the team/organisation.
Use employee competence profiles for immediate operational benefit, e.g. build project teams quickly and efficiently and deploy staff more effectively.	Build the most comprehensive picture of current competences, get recognition for the competences you have, with a view to moving forward in your career.
Generate business focused job specifications, advertisements and use in the interview process. Identify current and future skills gaps. Succession planning.	Be proactive beyond your additional role by learning competences valued by your organisation. Determine your compatibility with other roles.
Create business-focused but also more customised professional development training plans. Measure progress in a consistent manner.	Set goals and use as the basis for a personal development plan or annual review. Have a more objective dialogue with your supervisor.

Figure 3 Benefits of Competence Frameworks

Using competence frameworks in practice – a typical process:

Step 1: Assessment

The employee assesses his/her skills in a particular area, relating to his/her job, by selecting a number of pre-defined competences from a framework at a relevant level of proficiency. The output is a report or a 'competence profile'.

The supervisor may also complete the same exercise, providing his/her assessment of the employee's job-related skills, or simply review the results and make comments, or not do this step at all.

Step 2: Review and Validation

Both employee and supervisor review the assessment results and agree on the competence profile for the employee. Together they identify the gaps between the current skillset and the desired skillset. The employee and supervisor discuss these desires both from a business perspective and the employee's personal perspective. The competence framework can be used to structure this conversation, e.g. an employee might aspire to taking on new skills, or work towards a new role as specified in the framework. The supervisor may want to develop the employee's skills in a certain direction to fill immediate resource gaps, or in line with future organisational requirements.

Step 3: Action Plan

An action plan is created. Competence frameworks can be used to select education and training options by cross-checking competences against learning outcomes. Continuous professional development (CPD) activities include formal education and training but also professional activities, self-directed learning and informal learning. The 70-20-10 Learning and Development Model¹² (Lombardo, Eichinger, 1996) for example, says most learning happens 'on the job'.

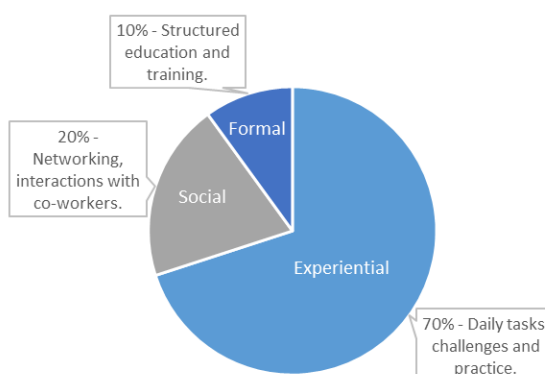


Figure 4 70-20-10 Learning and Development Model

Step 4: Upskilling and the CPD Cycle

A competence-based approach supports the continuous professional development cycle (see Figure 5). Progress/activity is recorded, regular scheduled reviews are undertaken where the assessment is repeated, before goals and learning and development plans are revised accordingly.

¹² Lombardo, Michael M; Eichinger, Robert W (1996). The Career Architect Development Planner (1st ed.). Minneapolis: Lominger. p. iv. ISBN 0-9655712-1-1.



Figure 5 The CPD Cycle

Competence frameworks can be costly and time-consuming for individual organisations to develop so making use of an already established and recognised framework is often preferable to starting from scratch, as well as ensuring that a consistent and common approach is taken.

The next section looks at existing e-skills competence frameworks in the health domain.

e-Skills Competence Frameworks in the Health Domain

European competence frameworks are useful in building a common understanding and in the mutual recognition of skills amongst Member States/Countries, their institutions and government bodies. The European e-Competence Framework¹³, for example, is a common European framework for ICT professionals across industry sectors and has been a European standard (EN 16234-1) since 2016.

In the health sector, competence frameworks for sectoral professions exist at national and European levels but may not cover the e-skills required by health professionals to any great degree.

Local and national initiatives and efforts that take place in healthcare settings to upskill health professionals in reaction to a change, e.g. how to use new IT hardware when it is introduced or when new IT systems replace manual processes, tend to be one-off training interventions with a specific purpose in mind, not mapped to a framework or standard, and not linked up to an overall workforce development plan around e-skills for health.

In terms of openly available frameworks or standards, DigComp 2.1 is a broad European digital competence framework for citizens, which contributes to workplace digital literacy, but is not focused on employment in general, or e-skills for health in particular.

The following is a selection of examples where e-skills for health professionals are described in terms of competences within a framework or strategy.

¹³ <http://www.ecompetences.eu/>

e-Skill for Health Professionals defined in Competence Frameworks

Finnish Nurses Association eHealth strategy 2015-2020

The strategy mentions 'strengthening citizen participation in the use and development of health and social services' and (relevant to this work) 'strengthening the competence of nurses as users of electronic services.' One stated aim is that 'nurses' training will teach skills in the use of technology, information literacy, knowledge management and the informatics process.' E-skills are embedded into nine competences for nurses such as the ability to use social media in a professional capacity, data protection and the ability to use patient records systems.

Health Informatics Career Framework (HICF)¹⁴

The HICF was developed by the NHS in England and Wales in response to the growing importance of informatics in health and care, and of ICT systems becoming more and more part of the way services are delivered and supported.

The aim of the HICF is to describe the profession in the same way that clinical and other professions in health and care are described and to establish career pathways and development opportunities. The HICF was first launched in 2008 and subsequently updated in 2009 and 2011.

The HICF does not address the breadth of healthcare professionals and their e-skills needs, but it shows a classification of jobs within career pathways, a methodology to facilitate workers navigation across the employment domain, and structure for managers to develop individuals and teams, and for healthcare systems to plan for workforce needs.

This useful framework, therefore, while making an important contribution to the health informatics workforce and showcases a sound approach to upskilling and career development, is not sufficiently aligned with the requirements of this task in the eHealth Action.

¹⁴ <https://www.hicf.org.uk/Index.aspx>

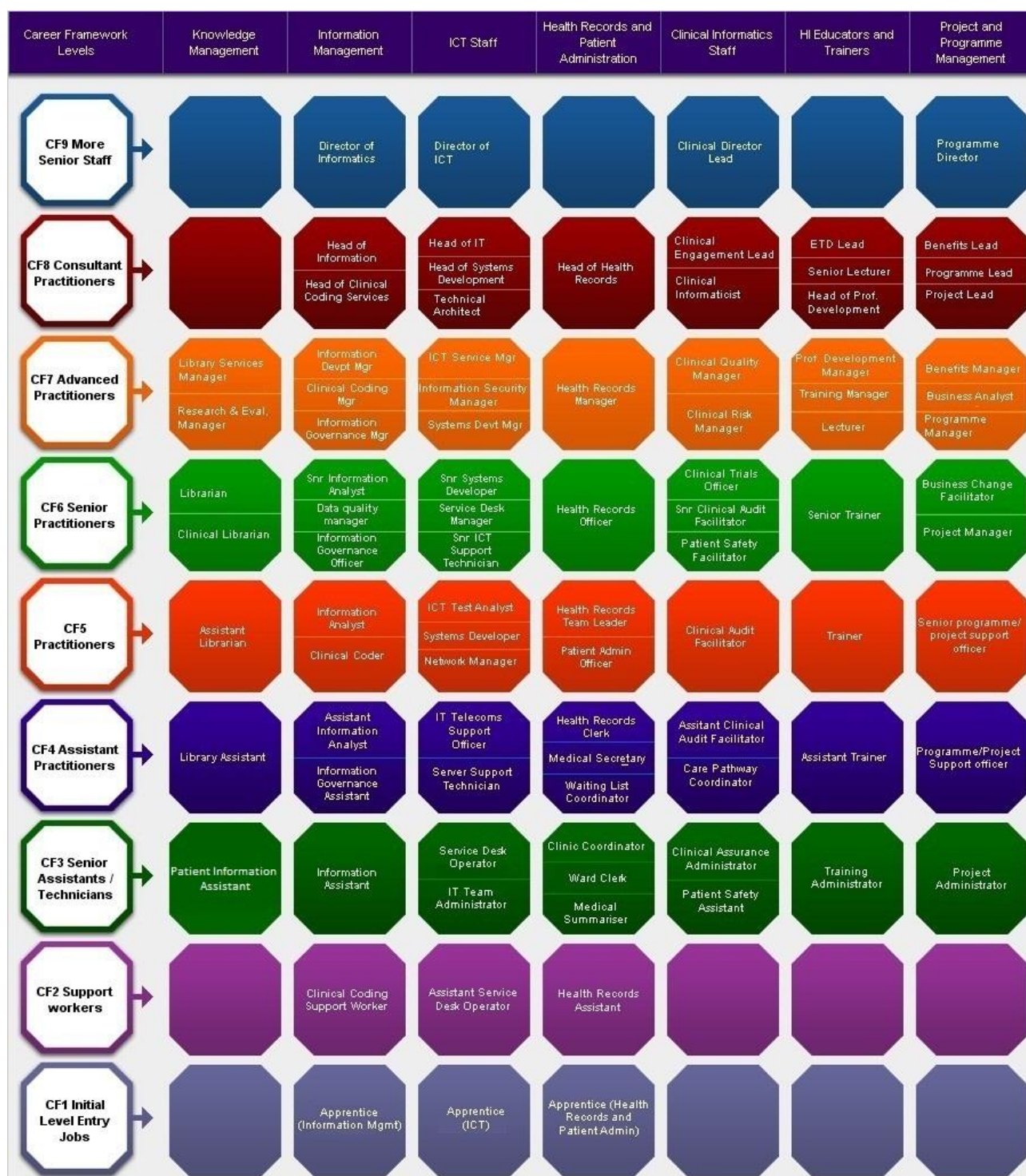


Figure 6 The Health Informatics Career Framework

Health Information Technology Competencies tool, HITComp¹⁵

HITComp is an open source online tool developed for the EU*US Workforce project that can be used for eHealth and digital skills research, educational development, skills assessment and career progression. The tool is described as containing 1,000 competencies in five healthcare domains and includes information and reference data on over 250 healthcare and allied health roles.

eHealth Capabilities Framework

In 2018, Brunner et al.¹⁶ published an eHealth Capabilities Framework aiming to support education providers in developing health curricula that meet the increasing need for digital health education. This framework developed as part of a project led by Tim Shaw at the University of Sydney requires graduates to acquire competences in four domains:

Capability Statement 1 – Digital Technologies, Systems and Policies

Capability Statement 2 – Clinical Practice and Applications

Capability Statement 3 – Data Analysis and Knowledge Creation

Capability Statement 4 - System and Technology Application

For each capability statement there is a list of knowledge items and performance (competence) elements.

The framework is designed as a foundation level for all health professionals. Capability statements are intended to be a resource for the review, development and alignment of profession-specific curricula.

CanMEDS¹⁷

CanMEDS is a framework that identifies and describes the abilities physicians require to effectively meet the health care needs of the people they serve, grouped thematically under seven roles. The CanMEDS framework specifies the competences that a doctor must have at the end of the academic pathway which includes the key concept 'Use health informatics to improve the quality of patient care and optimize patient safety'. CanMEDS was created in Canada by the Royal College of Physicians and Surgeons in the 1990s and has been updated twice since then. In 2017, the Royal College united with 12 Canadian health care organisations to improve patient care through consistent use of the CanMEDS Framework.

¹⁵ <http://hitcomp.org/>

¹⁶ Brunner M, McGregor D, Keep M, Janssen A, Spallek H, Quinn D, Jones A, Tseris E, Yeung W, Togher L, Solman A, Shaw T. An eHealth Capabilities Framework for Graduates and Health Professionals: Mixed-Methods Study. *Journal of Medical Internet Research* 2018 May 15;20(5):e10229. [doi: 10.2196/10229].

¹⁷ <http://www.royalcollege.ca/rcsite/canmeds/about-canmeds-e>

eHealth competence model

The eHealth competence model was developed as part of a previous joint action report on 'Recommendations on a Common Framework for Mapping Health Professionals' eHealth Competencies'¹⁸. This conceptual framework aimed to address the breadth of tasks related to eHealth service, defining thirty-seven healthcare professional 'role profiles' (as opposed to job specifications) grouped into three main areas of health, non-health and IT. These roles are defined in terms of the essential e-skill competences required to perform them.

The eHealth competence model is inspired by the European e-Competence Framework. A total of fifty-two competences are defined and expressed at various levels resulting in a possible total of 144 selections. Competences are arranged into six domain areas: manage, plan, build, use, run and enable. Each competence is related to a specific set of knowledge, skills and proficiency levels.

Under the health area (aimed at clinical professions involved in the delivery of eHealth services), there are seven role profiles. Each profile models a typical position combining a set of mission statements, tasks and competences as illustrated in Figure 7. The number of ✓'s indicates the level at which that competence is held. Note that health role profiles mainly comprise competences from the 'F. USE' category of the framework.

AREA	COMPETENCY	7 x Health Role Profiles						
		Healthcare Dept./Service Manager	Healthcare Specialist	Healthcare Provider/ Practitioner	Healthcare Technician	Care Coordinator	Medical Scribe	Public Health Practitioner
D. ENABLE	D.3. Education & Training Provision		✓✓✓					
	D.9. Personnel Development		✓✓✓					
	D.10. Information & Knowledge Management	✓✓✓✓	✓✓✓✓	✓✓✓✓		✓✓✓		
	D.11. Needs Identification	✓✓✓✓						✓✓✓✓
	D.13. Data Analysis, Modeling & Reporting							✓✓
	D.14. Standards & Interoperability Requirements Adoption						✓✓✓	
	D.15. Healthcare ICT Infrastructure						✓✓✓	
E. MANAGE	E.4. Communication & Relationship Management					✓✓✓✓		✓✓✓
	E.11. Healthcare Services & Operations Management	✓✓✓✓						
	E.12. Healthcare ICT Legislation, Policy & Procedures Mgmt.							✓✓✓
F. USE	F.1. Communication & Integrated Healthcare ICT Solns. Usage	✓✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓✓	
	F.2. Health Decision Support Solutions Usage	✓✓✓✓	✓✓✓✓	✓✓✓				
	F.3. Patient Access & Engagement Assistance to ICT Usage		✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	
	F.4. Electronic Records Management	✓✓✓✓	✓✓✓✓	✓✓✓	✓✓			
	F.5. Electronic Health Information Collection & Storage	✓✓✓✓	✓✓✓✓	✓✓✓	✓✓			
	F.6. Electronic Health Information Usage, Exchange & Sharing	✓✓✓✓	✓✓✓✓	✓✓✓	✓✓			

Figure 7 e-Skills Competences by Health Role Profile

The eHealth competence model has the potential to be used as a common language to enable future learning and training initiatives to best fit the actual needs of all actors involved in eHealth services development and use and be re-used across all Member States/countries.

¹⁸ JAsEHN D7.1.3 Recommendations on a Common Framework for Mapping Health Professionals' eHealth Competencies [Internet]. 2018. Available from: http://jasehn.eu/wordpress/wp-content/uploads/2018/07/JAsEHN_D7.1.3_RECOMMENDATIONS_common_Framework_mapping_health_profession....pdf

The eHealth Network's Multiannual Work Programme 2018-2021¹⁹ recommends operationalising this framework based on a common agreed foundation. Therefore, the eHealth competence model was deemed to be of most relevance and practical use to this task, affording the opportunity to use the model to test a competence assessment process with health professionals in a pilot scenario, as described in the following section.

¹⁹ https://ec.europa.eu/health/sites/health/files/ehealth/docs/ev_20170509_co01_en.pdf

Section 4 – Approach to the Task

Full details of the methodology employed to achieve the deliverables of Task 6.3 were included in two information notes previously submitted to the eHealth Network in November 2018 and June 2019. An overview of the approach is described in this document.

Competence Self-Assessment Exercise

A practical approach was taken from the outset to increase the relevance of deliverables and garner contributions and feedback from the target group. This meant testing out the use of a competence framework by practising health professionals in a self-assessment exercise, then evaluating the exercise and possible use of competence frameworks in a broader process to develop the e-skills of health workers.

A pilot was conducted in four Member States/countries: Ireland, Cyprus, Portugal and Serbia, from May 2019 to January 2020.

The objectives of the pilot was:

- To provide access to the JAseHN eHealth competence model and its associated health role profiles to practising health professionals.
- To have selected cohorts of health professionals perform a competence self-assessment exercise using the competence framework and analyse the results.
- To obtain opinions on e-skills in healthcare from the professionally active health workforce.
- To obtain opinions on the usefulness, or otherwise, of such a self-assessment exercise using an e-skills competence framework for the health workforce and the potential applications of the framework in developing the e-skills of health workers.

Although the objective was not to assess the level of e-skills competence among targeted sectors of practising health professionals, it was an interesting exercise to analyse competence selections overall and by category of health professional (see Appendix A for full results).

Pilot participants were drawn from five EU-recognised categories of health professionals²⁰: doctors, nurses, midwives, dentists and pharmacists. Participants were recruited by Task 6.3 contributors by raising awareness of the task and garnering support from their networks. A group of nurses and a group of midwives from Ireland took part on the instruction of senior management, all others volunteered to get involved. In an exercise that took approximately 30 minutes and was completed anonymously online, pilot participants were asked to:

- Self-assess their e-skills competence against the eHealth competence model, in detail against the competences of each of the seven health profiles, and then by scanning the rest of the model for additional competences that they felt they held.
- Provide feedback by completing a short online survey.

²⁰ https://ec.europa.eu/growth/single-market/services/free-movement-professionals/qualifications-recognition_en

Conducting online pilots made it more convenient for participants and enabled a wider audience to be reached. As the eHealth competence model was built in a similar structure to the European e-Competence Framework, an existing tool created by the Irish Computer Society to measure ICT professionals' competence was adapted for the pilot.

Each participant was provided with a unique username and password which allowed them access to the online tool. The exercise was recommended to be completed in one sitting, but a participant could log in and out of the tool multiple times during the pilot.

Participants were provided with an information leaflet, a step-by-step user guide and a short demonstration video to support their interaction with the CareerPlus tool. The following is a short summary of that exercise.



Figure 8 Steps in the pilot exercise

Step 1 Participants were asked to enter an optional job title for information.

Step 2 The seven 'Health Profiles' (as opposed to job titles) of the eHealth Competence Model were already pre-defined in the online tool. Participants were asked to select the job profile closest to their own from a drop-down list. For each health profile a description and the competences that apply were displayed. In this example we can see that the Care Coordinator health profile has e-skills competences under the Enable, Manage and Use categories only.

Health - Plan	Care Coordinator Summary: Allied health professional specialized in fields with technical responsibilities who assists physicians and nurses in the provision of direct and indirect care to patients. Mission: Supervises interdisciplinary care by bringing together the different specialists whose help the patient may need, being responsible for monitoring and evaluating the care delivered. Main tasks to achieve the mission include orienting and educating patients and their families, by initiating the care plan, providing educational information in conjunction with direct care providers related to treatments, procedures, medications, and continuing care requirements, monitoring delivery of care by completing patient rounds, document care, identifying progress towards desired care outcomes, intervening to overcome deviations in the plan, interacting with involved department to negotiate and expedite scheduling and completion of test, procedures and consults, and maintaining ongoing communication regarding variances from the care plan or transfer/discharge plan.
Health - Build	
Health - Run	
Health - Enable	
Information and Knowledge Management	
Health - Manage	
Communication and Relationship Management	
Health - Use	
Communication and Integrated Healthcare Solutions	
Patient Access and Engagement Assistance to ICT Usage	

Figure 9 Health Role Profile example

Clicking on each competence displayed further details including additional skills and knowledge items. Participants selected the key proficiency level of any competences they believed they had. The reset button allowed for a change of mind.

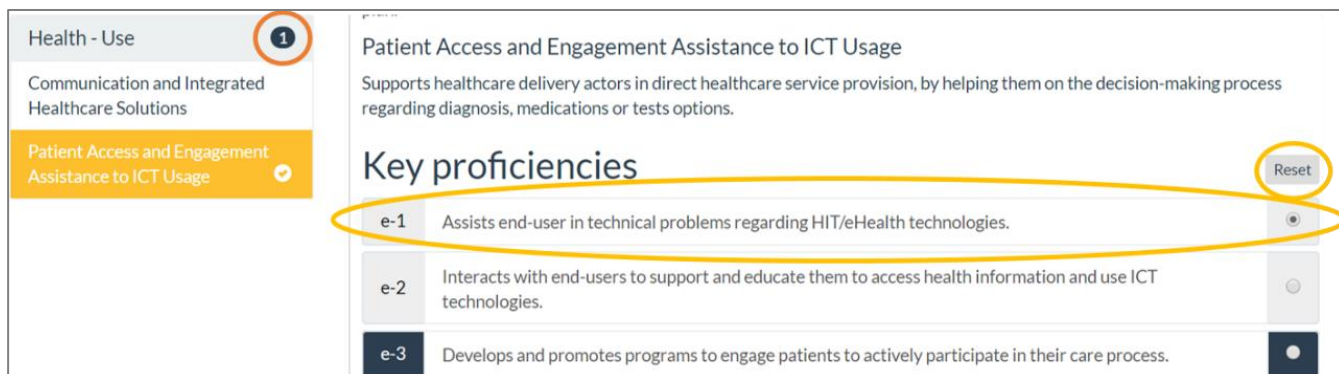


Figure 10 Competence and key proficiencies example

Step 4 Participants made a final check that they had captured the full extent of their e-skills competence by interrogating all the competences in the framework, not just the ones associated with a health profile.

Step 5 Clicking My Profile at any time generated a snapshot of selections made. The dark shaded boxes for each competence represent the key proficiencies that were available, and the yellow tick represents a selection by the participant.

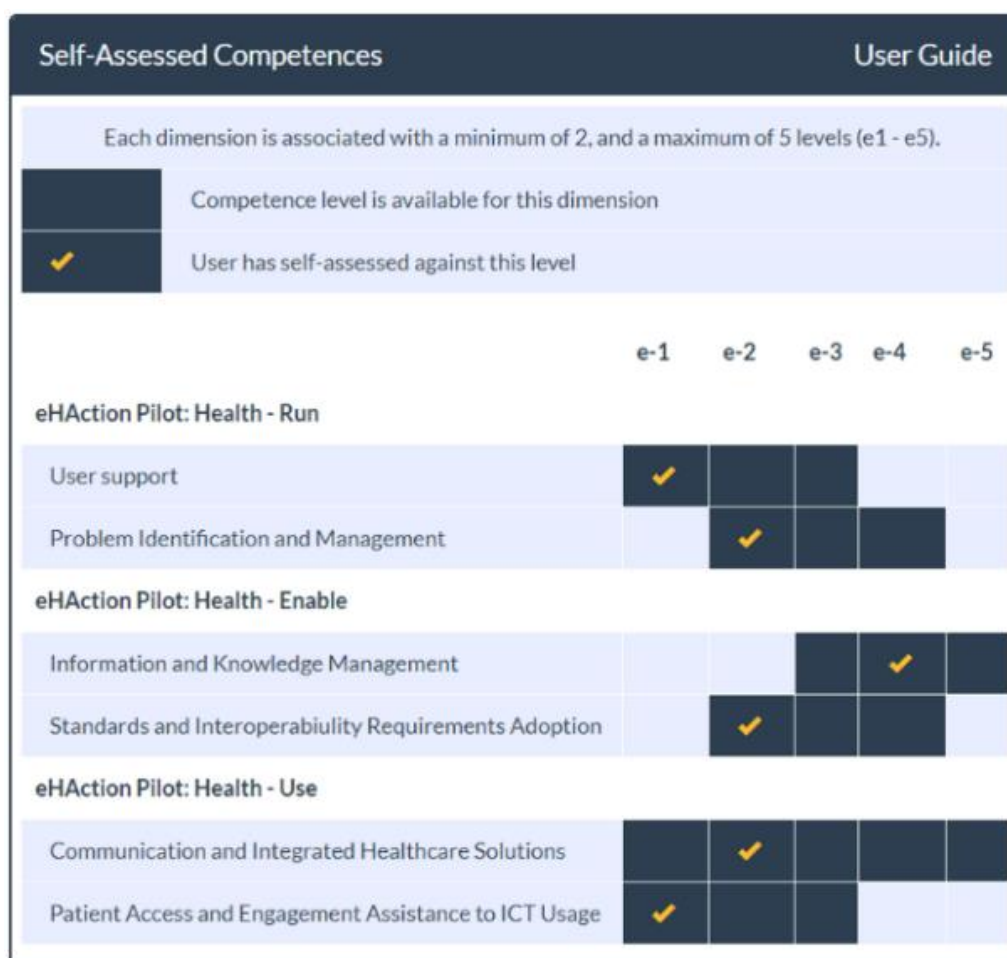


Figure 11 My competence profile example

Stakeholder Interviews

From September 2019 to January 2020, eighteen qualitative semi-structured interviews with key stakeholders and subject matter experts were conducted in Ireland, Cyprus, Lithuania, Hungary, Finland and Portugal (see Appendix C for details of interviewees). The objectives of these engagements were:

- To acquire in-depth insight on the digital literacy, digital maturity and capability, preparedness and willingness for e-skills development from selected stakeholders.
- To get expert comment on the work carried out to date within the task and input into how common standards or frameworks may be exploited to develop the e-skills of health professionals.

Topics for exploration included:

- Digitalisation and telemedicine – the current state of the country, simply the opinion of the expert here to help set the scene, rather than a substantial research exercise.
- The attitude of the health workforce towards digital health and motivational factors.

- The digital preparedness and maturity of the workforce and perceived skills gaps – expert opinion.
- The role of standards or frameworks, if any, in improving the e-skills of health professionals, the value of a European framework and the impact on cross border health services.
- Training and upskilling – information on e-skills/eHealth programmes for health workers and continuous professional development opportunities in the country.
- Reflecting on the aim of the task – the effectiveness and application of competence frameworks in developing the e-skills of health professionals.

Section 5 – Results

The pilot as described in the previous section was conducted between 8 May 2019 and 31 January 2020 in Ireland, Cyprus, Serbia, and Portugal. 180 pilot participants signed into an online tool that contained the competence framework for self-assessment and a qualitative survey. Although both framework and survey were accessed in the same way, they were not linked, so it was possible for participants to choose to skip the competence self-assessment exercise and only complete the qualitative survey. This likely explains the completion of 180 surveys and 175 attempted self-assessments.

Apart from the group of nurses and midwives who completed the pilot on the instruction of senior management, the rest of the pilot was conducted on a voluntary basis with minimal support. This might suggest that pilot participants are already more positively predisposed to the digitalisation of health services and are also more confident about their e-skills abilities than their colleagues. It is possible that the pilot participants do not represent the 'average' e-skills profile of a health professional in each category/country.

The pilot was conducted in English. This was perceived as a barrier to participation in Portugal and Serbia. Some survey responses were written in Portuguese and subsequently translated into English, using the Google Translate tool for the purpose of analysis.

It is worth bearing in mind that studies have shown that, in general, in a self-assessment scenario, people tend towards over-estimating their digital skills²¹.

Competence Self-Assessment Exercise

During the period under review 175 health professionals (22 from Cyprus, 36 from Ireland, 65 from Portugal and 52 from Serbia) completed an online competence self-assessment broken down by profession as: 47 nurses, 29 midwives, 40 doctors, 24 dentists and 35 pharmacists. Participants were asked to select any competence that they felt they had, at the appropriate level of proficiency.

The mean number of selections made by pilot participants was 7.03, the mode was 7 and the median was 10.5. This is broadly in line with the number of competences associated with each of the seven health role profiles. The highest number of selections by an individual participant was 51 (a Cypriot midwife), then 50 (a Cypriot nurse), then 48 (a Cypriot nurse), then 38 (a Portuguese nurse). These three results are probably outliers as the next highest number of selections was 15, or else these participants hold senior positions in their respective fields contributing to strategy and planning at a high level. Note, however, that these participants did not submit their job titles and nothing in their qualitative survey responses indicates their level of seniority.

The most popular competence overall with 95 selections was in the 'F. USE' category: Health Decision Support Solutions Usage, at proficiency level 3. This was also the most popular choice within each of the five categories of health professional.

²¹ Perception and Reality: Measuring Digital Skills. ECDL Foundation. [Internet] 2016. Available from: <http://ecdll.org/blog/?i=1585>

Competence name	Competence Description
Health Decision Support Solutions Usage	Supports healthcare delivery actors in direct healthcare service provision, by helping them on the decision-making process regarding diagnosis, medications or tests options.
Level 3 Key Proficiency	
Uses health decision support systems on the daily practice to help on the decision-making process. Collaborates to improve and enhance these tools with technical knowledge and clinical knowledge.	

Figure 12 The most popular competence and level chosen by pilot participants

Figure 13 below best shows how many selections were made for each competence taking all participants as one group. Appendix A show results per category of health professional.

eHealth Competency Model ALL selections

Dimension 1 COMPETENCY AREAS	Dimension 2 COMPETENCY	Dimension 3 PROFICIENCY LEVELS				
		1	2	3	4	5
A. PLAN	A.1. IS & Healthcare Strategy Alignment				7	2
	A.2. Service Level Management			4	2	
	A.3. Healthcare ICT Strategy Development			4	2	1
	A.4. Healthcare ICT Planning		3	6	3	
	A.5. Architecture Design			4	1	1
	A.6. Application Design	4	1	1		
	A.7. Technology Trend Monitoring				4	3
	A.8. Sustainable Development			5	1	
	A.9. Innovating				5	1
B. BUILD	B.1. Application Development	4	1	1		
	B.2. Component Integration			1	1	
	B.3. Testing	5	2		1	
	B.4. Solution Deployment	1	2	1		
	B.5. Documentation Production	2	1	4		
	B.6. Systems Engineering			3		
C. RUN	C.1. User Support	6	3			
	C.2. Change Support		3	2		
	C.3. ICT Service Delivery		1	3		
	C.4. Problem Identification & Management		4	2	1	
D. ENABLE	D.1. Information Security & Privacy Strategy Development				4	2
	D.2. ICT Quality Strategy Development				2	2
	D.3. Education & Training Provision		15	9		
	D.4. Purchasing		4	2		
	D.5. Sales Proposal Development		2	2		
	D.6. Channel Management			4		
	D.7. Sales Management			3	1	1
	D.8. Contract Management		3	1	1	
	D.9. Personnel Development		6	10	4	
	D.10. Information & Knowledge Management			35	53	45
	D.11. Needs Identification			11	4	2
	D.12. Digital Marketing & Communication		3		2	
	D.13. Data Analysis, Modeling & Reporting	5	2	1		
	D.14. Standards & Interoperability Requirements Adoption		6	2		
	D.15. Healthcare ICT Infrastructure		7	1		
E. MANAGE	E.1. Forecast Development			4		
	E.2. Healthcare ICT Project Management		3	2	1	1
	E.3. Risk & Compliance Management		2		1	
	E.4. Communication & Relationship Management			7	3	
	E.5. Process Improvement			5	2	
	E.6. ICT Quality Management		2		3	
	E.7. Healthcare Business Change Management			4	2	
	E.8. Information Security & Privacy Management		5		1	
	E.9. IS Governance				3	1
	E.10. Financial & Account Management			2		
	E.11. Healthcare Services & Operations Management		6	8	5	1
	E.12. Healthcare ICT Legislation, Policy & Procedures Management		2	2	2	
F. USE	F.1. Communication & Integrated Healthcare ICT Solutions Usage	42	42	24	20	12
	F.2. Health Decision Support Solutions Usage			95	28	
	F.3. Patient Access & Engagement Assistance to ICT Usage	25	38	45		
	F.4. Electronic Records Management		78	27	34	
	F.5. Electronic Health Information Collection & Storage		72	35	25	
	F.6. Electronic Health Information Usage, Exchange & Sharing		79	29	24	

Figure 13 Total Selections by Competence and Level of Proficiency

Survey

Each pilot participant was asked to complete a short questionnaire on their attitudes, experience, etc. 180 surveys were completed, 22% by midwives, 27% by nurses, 22% by doctors, 12% by dentists and 17% by pharmacists. The profile of survey respondents is shown in Figure 14.

Category	Responses	Gender		Age					Number of years since graduating from university/training					Did you receive any e-skills training as part of your primary degree/training, to achieve your qualification?	
		Female	Male	20-29	30-39	40-49	50-59	60-69	0-5	5-10	10-20	20-30	>30	No	Yes
Nurses	48	44	4	6	16	19	6	1	10	9	14	10	5	22	26
Midwives	40	40		6	9	13	12		5	5	11	14	5	22	18
Doctors	39	23	16	6	10	7	12	4	6	8	9	9	7	17	22
Dentists	22	16	6	5	8	4	4	1	5	7	4	4	2	12	10
Pharmacists	31	26	5	15	6	5	5		13	6	4	5	3	22	9
Totals	180	149	31	38	49	48	39	6	39	35	42	42	22	95	85

Figure 14 Survey Respondent Profile

A breakdown of participants who received e-skills training according to the numbers of years since graduation is shown below.

Number of years since graduating from university/training	Did you receive any e-skills training as part of your primary degree/training, to achieve your qualification?			
	No	%	Yes	%
>30	18	82%	4	18%
20-30	22	52%	20	48%
10-20	20	48%	22	52%
5-10	16	46%	19	54%
0-5	19	49%	20	51%
	95	53%	85	47%

Figure 15 Survey Respondents and e-skills training received in third level education

The full questionnaire and analysis of results can be referred to in Appendix B but the main results from the survey are summarised here.

On e-skills:

- The vast majority of respondents thought that having adequate e-skills is important in their roles (87% selected 6 or higher on a scale of 1-10, n=180).
- Three quarters of respondents felt that their current level of e-skills competence is adequate to perform their role (83% selected 6 or higher on a scale of 1-10, n=180) and yet, interestingly, just over half of respondents did not receive any e-skills training as part of their primary degree or training (see Figure 15). A lesser majority of respondents felt competent to assist patients in accessing eHealth information and services (69% selected 6 or higher on a scale of 1-10, n=180).

On motivation:

- The majority of respondents felt motivated to improve their e-skills (84% chose 'yes', 16% chose 'no', $n=174$) and felt it was important to have adequate e-skills for career advancement (89% selected 6 or higher on a scale of 1-10, $n=180$).
- The split between those who felt sufficiently supported at work to help improve their e-skills and those who did not was close (47% chose 'no', 53% chose 'yes', $n=174$).
- The most popular motivating factor in improving e-skills was for better performance, either personally, or organisationally, to provide better services and care to patients (57%, $n=150$). Lack of time was the most suggested barrier to improving e-skills (47%, $n=119$), followed by inadequate education or training (15%) and technology/infrastructure (11%).

Opinions on the framework:

- Opinion was divided on the online tool and eHealth competence model. This could be, in part, due to language difficulties and also that the tool was not designed specifically for this target audience but adapted from an existing product. There was an almost even split between those who answered positively about the ease of use of the tool, benefits of the documentation and helpfulness of the additional skills and knowledge item descriptors and those who answered negatively.
- 50% ($n=158$) felt that their e-skills competence matched one of the pre-defined health role profiles. 32% said a combination of health role profiles best reflected their e-skills competence and 16% said none of the health profiles reflected their use of e-skills in their role.
- There were comments on the language used to describe the competences such as: **'too wordy'**, **'language very flowery'**, **'the IT language used is not common to me'**, **'the questions/competences were at times difficult to follow'**, and **'questions were very difficult to understand... some quite vague'**.

General feedback:

- General comments on e-skills training included calls for **'basic HIT training'**, **'computer training for all'** and **'training for aspects and skills for daily job'**, plus a comment that **'skills won't be improved by maybe 3-4 online programmes completed in the year.'**
- One comment focused on data analytics, a topic also raised in the stakeholder interviews:
"I don't think we fully understand what this generation of data may mean for research, trends, etc. I think there is a gap in training on data analytics specifically for health and would like to see more training courses in this area."
- Two pharmacists made these specific observations about eHealth and pharmacy:
'... We need to know what the broad plans are for electronic prescribing, for example, are...'
'In healthcare, pharmacists are at the intersection of patient-care and assorted healthcare professionals as well as the contact point when patients transition from institutional to community care. Most healthcare ICT solutions appear focused on physician/consultant needs and this limits the applicability to pharmacists...'
- Finally, suggestions about using competence frameworks to develop the e-skills of health professionals included focusing on the work environment by incorporating more practical

examples into the competence framework, tailoring training to the day job, conducting individual competence assessments and repeating the process annually: ***'It should be built into the nursing programme, with an online easy use competency annually to maintain the skills'.***

- One comment in particular sums up the challenge in developing the e-skills of health professionals so they may contribute to the digital transformation of the health sector, and where competence frameworks may be able to help:

'We don't know what we don't know.'

Stakeholder Interviews

Interviews were conducted between September 2019 and January 2020 with a variety of stakeholders as shown in Figure 16.

	Hospital Management/IT	Practising Health Professional	Academic	Ministry of Health official	Competence Centre	Health Service Manager	Professional Representative Body
Ireland	2		1			1	
Cyprus			2	1			
Lithuania	2			1	1		
Hungary		1				1	
Finland			1		1	1	
Portugal				1			
EU							1

Figure 16 Interviewees and their roles

Responses were varied on most of the questions, reflecting the different levels of eHealth maturity in each country, but some common themes emerged.

On motivating health professionals:

- Strong leadership is needed to inform and demonstrate the benefits of eHealth for their jobs and their patients.
- There remain mixed attitudes towards digitisation; initially health professionals are reluctant because of fear of increased workload but with time become more positive. Change in behaviours bring about changes in attitude.
- Include health professionals in decision making and co creation processes. Identify and use change agents.
- Patients motivate health professionals because they want to provide a better standard of care for their patients. Win over the patients by implementing systems that empower them and you will win over the health professionals.

On competence frameworks for assessing and developing health professionals' e-skills:

- There is a role for competence frameworks in gaining a common understanding of what e-skills competence means and assessing current skill levels in a particular health setting. Stakeholders and pilot participants expressed the desire for regular training to be integrated into work schedules. Mapping training to a competence framework may make it easier to isolate specific competence gaps and then design smaller, focused, but regular training interventions that are delivered within the constraints of the working week.
- General standardised e-skills training is critical as a baseline for all health professionals. Basic e-skills taught in health science studies set the scene for further specialisation. These e-skills can be expressed as competences and standardised in healthcare, applicable to any system, anywhere.
- An alternative view to the previous point was that competence frameworks are most useful in mapping the specialised, role-specific e-skills requirements of health professionals.

On e-skills training:

- Training, both practical and theoretical must be accompanied by assessment and recognition of achievement, but most importantly must be based on individual needs. One single solution will not suit everyone. Competence frameworks can act as a 'non-invasive' check of a health professional's e-skills competence and then be a structure upon which to design suitable training interventions or CPD programmes.

On frameworks and cross-border health:

- It is important to ensure a baseline standard for all health professionals, no matter what country or regions they are coming from. Patients should be able to trust that they will receive health services of a similar quality throughout Europe. A common framework was seen as potentially beneficial in this scenario because it could be that consistent standard in e-skills competence against which health professionals could be measured and trained. An EU framework was seen to 'have weight'.

Section 6 – The Students' Perspective

How do the attitudes of practising health professionals challenged to learn new skills in pressurised work environments compare with health science students preparing to enter the workplace? Are young people, having grown up in the digital age, more confident in their abilities to use eHealth technologies? Evidence suggests that students share similar concerns about competence.

European Medical Students' Association (EMSA)

In 2018, the European Medical Students' Association (EMSA) surveyed 451 medical students in 38 countries between the ages of 18 and 24. The results indicate a gap between an overall positive attitude towards digital technologies and the lack of digital health literacy and insufficient practical training²². The survey showed that a large proportion of the students (53%) considered their eHealth skills as 'poor' or 'very poor'. Furthermore, less than half (40%) agreed or strongly agreed that they felt prepared for working in a digitalised healthcare system. In turn, the majority (85%) agreed or strongly agreed to eHealth being more implemented in medical curricula. Examples of the courses requested included 'Basics of eHealth' and 'Training with Technologies' such as Health Information Systems, Telehealth and mHealth.

In line with recent scientific works (Fridsma 2018²³; Topol 2019²⁴), the EMSA survey on eHealth found that medical students wish to receive education on telemedicine and mHealth as well as on artificial intelligence in healthcare, genomics and data analytics. Practical training with digital health technologies in order to acquire the necessary digital skills was also strongly demanded.

Student-centred inter-professional education

For the wider deployment of eHealth, the development of e-skills and digital health literacy of the future health workforce is as important as of those already practising. Thus, EMSA calls on (medical) faculties to encourage the dialogue between teachers and students to assess the necessities of improvement regarding the implementation of digital health into the curriculum. As the emerging technologies will impact effective communication, teamwork and inter-professional collaboration of future working environments, it is crucial to include inter-professional formats in digital health education especially focusing on engineering, informatics, data science and entrepreneurship.

²² European Medical Students' Association. 2019. 'EMSA Survey on EHealth Presentation Deans Meeting Rotterdam'. 2019. Available from: <https://emsa-europe.eu/wp-content/uploads/2019/07/ESD-Deans-Meeting-Rotterdam-2019-1.pdf>

²³ Fridsma DB. Health informatics: a required skill for 21st century clinicians. BMJ 2018 Jul 12;k3043. [doi: 10.1136/bmj.k3043].

²⁴ Topol E. Preparing the healthcare workforce to deliver the digital future [Internet]. 2019. Available from: <https://topol.hee.nhs.uk/wp-content/uploads/HEE-Topol-Review-2019.pdf>

European Pharmaceutical Students' Association (EPSA)

In 2017, The European Pharmaceutical Students Association (EPSA) conducted a survey²⁵ of 587 European pharmaceutical students and recent graduates, and was able to verify that pharmaceutical studies are, in general, lacking education on eHealth.

Regarding their knowledge and skills on eHealth and digital skills, less than 15% of the respondents considered themselves aware of what eHealth is and almost 63% evaluated their digital skills as average or under average. Three-quarters of respondents claimed to have no or almost no education on eHealth while more than half were not made aware of the topic during their studies. Although the vast majority of pharmaceutical students have experience in using software such as Microsoft Word and Excel, only a few are able to utilise it in a way that provides advanced healthcare services and upholds patients' trust.

More than 90% of survey respondents believed that eHealth would change the pharmaceutical curricula and profession for the better. They also believed new digital skills improve communication with patients and that digital tools will grant pharmacists more time for patients and provide a higher quality treatment. However, some students also pointed out that it is important for digital skills to be used in the right, efficient and safe way. Therefore, healthcare professionals should be the ones facilitating the implementation of eHealth technology.

Almost all respondents were willing to take classes related to eHealth and digital skills, requesting courses on regulatory context of eHealth, security of information, personal data and privacy concerns as well as opportunities to obtain knowledge on basic programming and robotic technology. For higher efficiency, it was suggested that courses should be delivered jointly by a pharmacist and a healthcare informatics expert as well as taking some of these courses with other healthcare professionals, simulating the real-life professional experience.

The current pharmaceutical curricula were frequently classified as overburdening, and providing mandatory extra classes would not necessarily be the ideal solution. Pharmaceutical students mostly supported having open elective courses or conducting internships that could be managed alongside their studies.

During the EPSA Annual Reception hosted at the European Parliament in Brussels in 2019 on the topic of 'Digitalisation in healthcare and its challenges for the pharmaceutical profession' among other issues the below points were made:

- EPSA calls on educational institution to include eHealth and digital skills in educational systems as an investment for the future and a possible sustainability measure for healthcare services.
- EPSA supports future trainings and education in the field of eHealth and digital skills, from utilisation and optimisation to benefits and dangers.
- EPSA believes that pharmaceutical and other healthcare professionals should be at the core of the implementation of eHealth in current treatment protocols. Pharmacists as highly educated, qualified and accessible healthcare professionals are crucial in this aspect.

²⁵ <https://epsa-online.org/LLeaP/2019/09/17/position-paper-on-ehealth-and-digital-skills-has-been-published/>

Section 7 – Discussion

It is clear from our activities and investigations that the topic of e-skills for health professionals is linked to the successful implementation of eHealth and is coming to fore as an important topic. Pilot results clearly show that a majority of respondents to the qualitative survey agree that developing the e-skills of the health workforce is extremely important in order to fully realise the benefits of eHealth. Policy makers at EU and national level reflect this view. There is interest on the ground from health science students as evidenced by the EMSA and EPSA surveys and the Deans Meeting shows that medical faculties are also taking note.

e-Skills competence frameworks have the potential to benefit everyone.

Despite growing interest in this subject from stakeholders at every level in health, i.e. the health professional, healthcare institutions, health science education institutions, policy makers, etc. and within the boundaries of this task, we were unable to find a practical EU implementation of an e-skills competence framework. However, from our activities in this task we conclude that a competence-based approach has potential benefits for all of these stakeholders:

- The use of common standards or frameworks can serve as a reference and a common language from which to create programmes that are embedded into curricula for undergraduates and training programmes for practising health professionals.
- Healthcare institutions and organisations can use e-skills competence frameworks to advance the e-skills of current health professionals.
- The individual health professional, in committing to continuous professional development, can reference an e-skills competence framework in order to gauge their current competences with a view to moving forward in their careers.

e-Skills competence frameworks have value at all stages of education, training and development.

Health professionals are educators whose proficiency in digital health has a direct impact on learning outcomes of undergraduates. For instance, Li et al. found that ‘ensuring the competence for educators could impact on the IT skill improvement most²⁶’. Ultimately, teaching of digital health literacy and skills must follow a holistic approach and be integrated equally into undergraduate teachings and continuing professional development. Competence frameworks may have a role to play in supporting this continuum of education:

- Using competence frameworks to build e-skills into health science curricula ensures a consistency in teaching on this subject across the EU. It also embeds the concept of CPD early on.
- Competence frameworks can be used to describe the e-skills necessary for particular roles or map career pathways for practising health professionals.

²⁶ Li S, Bamidis PD, Konstantinidis ST, Traver V, Car J, Zary N. Setting priorities for EU healthcare workforce IT skills competence improvement. *Health Informatics J* 2019 Mar 1;25(1):174–185. [doi: 10.1177/1460458217704257].

- On a regular basis, over and above the basic training that comes most of the time from the solution provider, competence frameworks can assist in identifying gaps in knowledge and implement the learning and support based on individual needs.

Motivation is key.

Motivating health professionals to engage in a competence based approach to e-skills development is critical to success. Established change management strategies such as communicating the purpose and potential benefits of such an exercise, utilising local 'champions' to gain buy-in, creating opportunities for early 'wins', changing behaviour incrementally to build momentum and showing strong leadership throughout all apply here. 'Strong leadership' in particular was mentioned throughout stakeholder interviews.

Is it practical to create an EU framework on e-skills for health professionals?

In stakeholder interviews there was a generally positive response on the value of EU-recognised standards and frameworks. In order to succeed, any competence framework must be easy to administer, easy to understand and clearly linked to a business purpose. Therefore, it may be a challenge to define an over-arching EU competence framework on e-skills for the health workforce that is generic enough to appeal to the broadest audience but yet speaks to all scenarios and situations in health. If you focus on general basic e-skills then you lose some relevance, if it's too narrow in focus you risk losing widespread adoption. Exchanging best practice between Member States/countries and building on existing proven frameworks and structures, where they exist, may be beneficial in answering this question.

The future role of health professionals

New and emerging technologies aim to collect and generate as much data about the patient as possible from multiple sources enabling more valuable insights that feed into personalised treatment plans, ultimately improving the quality of patient care. The new reality of the health professional's role as a data collector should be covered in health science curricula along with the recognition of the importance and responsibility to ensure health professionals have the requisite e-skills to carry out their work. Ultimately, health professionals must have the necessary e-skills to take advantage of advancements in health for the benefit of the patient.

Section 8 – Conclusion

Although the task ends with the submission of this final report, the following ideas may contribute to future discussions on the sustainability of effort and focus on the topic of e-skills for health professionals.

The eHealth Competence Model was developed during the JAseHN joint action that finished in June 2018. This task included the first practical implementation of the framework. Based on comments from pilot participants further work could be invested into clarifying the competences, proficiencies and descriptions of the framework, before revalidating the content in a similar pilot or by another mechanism.

The pilot reached 116 participants in five countries. A wider dissemination of the pilot amongst eHealth Network members could be considered to further validate the framework and to raise awareness about this topic. During this task we received some positive responses from European representative bodies supporting wider dissemination of the survey.

Access to the online tool for the pilot was controlled by user logins. Getting greater numbers of health professionals to complete an online competence assessment exercise would require an online tool, portal or website to be procured or developed, or an existing tool to be adapted, to make it as easy as possible for a wider audience to access and use whilst retaining the ability to analyse the data.

That task group piloted the first step in a competence based approach to workforce development i.e. health professionals assessed their e-skills competence against a framework. A deeper exploration of the use of competence frameworks in developing e-skills in the health workforce would need a more comprehensive pilot to be conducted in an organisational setting i.e. one that follows through from competence mapping to learning outcomes and training plans, delivery, assessment and reflection with a cohort/s of health professionals, generally following the steps outlined in section 3.

There is support for the inclusion of e-skills in medical curricula as evidenced by the European Deans' Meeting. This meeting was an important proactive step in the right direction in terms of highlighting ways of preparing the current and future doctors for the digital transformation of healthcare and integrating e-skills into medical education. The practical implementation of competence frameworks in assisting the development of such curricula could be taken up by health science educational institutions as soon as possible, in tandem with professional workforce upskilling initiatives.

Building on existing proven frameworks and structures are important factors for success if a sound methodology or guiding roadmap for Member States is to be developed. Although we could not find a practical European implementation of such an e-skills competence framework during the lifetime of this task, further research and/or exchanging best practice between Member States/countries could be of benefit.

Appendix A: Competence Selections by Health Professional Category

eHealth Competency Model with group selections - DENTISTS

Dimension 1 COMPETENCY AREAS	Dimension 2 COMPETENCY	Dimension 3 PROFICIENCY LEVELS				
		1	2	3	4	5
A. PLAN	A.1. IS & Healthcare Strategy Alignment					
	A.2. Service Level Management					
	A.3. Healthcare ICT Strategy Development					
	A.4. Healthcare ICT Planning				1	
	A.5. Architecture Design					
	A.6. Application Design					
	A.7. Technology Trend Monitoring					
	A.8. Sustainable Development					
	A.9. Innovating					
B. BUILD	B.1. Application Development					
	B.2. Component Integration					
	B.3. Testing					
	B.4. Solution Deployment					
	B.5. Documentation Production					
	B.6. Systems Engineering					
C. RUN	C.1. User Support					
	C.2. Change Support					
	C.3. ICT Service Delivery					
	C.4. Problem Identification & Management					
D. ENABLE	D.1. Information Security & Privacy Strategy Development					
	D.2. ICT Quality Strategy Development					
	D.3. Education & Training Provision		1	2		
	D.4. Purchasing					
	D.5. Sales Proposal Development					
	D.6. Channel Management					
	D.7. Sales Management					
	D.8. Contract Management					
	D.9. Personnel Development		1	1	2	
	D.10. Information & Knowledge Management			7	1	6
	D.11. Needs Identification			1		1
	D.12. Digital Marketing & Communication				1	
	D.13. Data Analysis, Modeling & Reporting	1				
	D.14. Standards & Interoperability Requirements Adoption			1		
	D.15. Healthcare ICT Infrastructure		1			
E. MANAGE	E.1. Forecast Development					
	E.2. Healthcare ICT Project Management		1			
	E.3. Risk & Compliance Management					
	E.4. Communication & Relationship Management			1	2	
	E.5. Process Improvement				2	
	E.6. ICT Quality Management				1	
	E.7. Healthcare Business Change Management			1	1	
	E.8. Information Security & Privacy Management					
	E.9. IS Governance					1
	E.10. Financial & Account Management					
	E.11. Healthcare Services & Operations Management		1	2	1	
	E.12. Healthcare ICT Legislation, Policy & Procedures Management		1			
F. USE	F.1. Communication & Integrated Healthcare ICT Solutions Usage	8	5	4		
	F.2. Health Decision Support Solutions Usage			10	2	
	F.3. Patient Access & Engagement Assistance to ICT Usage	2	3	4		
	F.4. Electronic Records Management		12	2	3	
	F.5. Electronic Health Information Collection & Storage		9	1	3	
	F.6. Electronic Health Information Usage, Exchange & Sharing		10	1	2	

eHealth Competency Model with group selections - DOCTORS

Dimension 1 COMPETENCY AREAS	Dimension 2 COMPETENCY	Dimension 3 PROFICIENCY LEVELS				
		1	2	3	4	5
A. PLAN	A.1. IS & Healthcare Strategy Alignment					1
	A.2. Service Level Management					
	A.3. Healthcare ICT Strategy Development					
	A.4. Healthcare ICT Planning			1		
	A.5. Architecture Design					
	A.6. Application Design					
	A.7. Technology Trend Monitoring					
	A.8. Sustainable Development					
	A.9. Innovating					
B. BUILD	B.1. Application Development					
	B.2. Component Integration					
	B.3. Testing					
	B.4. Solution Deployment					
	B.5. Documentation Production					
	B.6. Systems Engineering					
C. RUN	C.1. User Support					
	C.2. Change Support					
	C.3. ICT Service Delivery					
	C.4. Problem Identification & Management					
D. ENABLE	D.1. Information Security & Privacy Strategy Development					
	D.2. ICT Quality Strategy Development					
	D.3. Education & Training Provision		4	3		
	D.4. Purchasing			1		
	D.5. Sales Proposal Development					
	D.6. Channel Management					
	D.7. Sales Management					
	D.8. Contract Management					
	D.9. Personnel Development			3	2	
	D.10. Information & Knowledge Management			9	13	12
	D.11. Needs Identification			1	1	
	D.12. Digital Marketing & Communication					
	D.13. Data Analysis, Modeling & Reporting	1				
	D.14. Standards & Interoperability Requirements Adoption		1			
	D.15. Healthcare ICT Infrastructure		1			
E. MANAGE	E.1. Forecast Development					
	E.2. Healthcare ICT Project Management					
	E.3. Risk & Compliance Management					
	E.4. Communication & Relationship Management			1		
	E.5. Process Improvement			1		
	E.6. ICT Quality Management					
	E.7. Healthcare Business Change Management					
	E.8. Information Security & Privacy Management		1			
	E.9. IS Governance					
	E.10. Financial & Account Management					
	E.11. Healthcare Services & Operations Management			2	1	
	E.12. Healthcare ICT Legislation, Policy & Procedures Management					
F. USE	F.1. Communication & Integrated Healthcare ICT Solutions Usage	7	14	4	6	2
	F.2. Health Decision Support Solutions Usage			25	3	
	F.3. Patient Access & Engagement Assistance to ICT Usage	6	6	8		
	F.4. Electronic Records Management		21	4	5	
	F.5. Electronic Health Information Collection & Storage		19	4	5	
	F.6. Electronic Health Information Usage, Exchange & Sharing		23	1	6	

eHealth Competency Model with group selections - NURSES

Dimension 1 COMPETENCY AREAS	Dimension 2 COMPETENCY	Dimension 3 PROFICIENCY LEVELS				
		1	2	3	4	5
A. PLAN	A.1. IS & Healthcare Strategy Alignment				2	1
	A.2. Service Level Management			2	1	
	A.3. Healthcare ICT Strategy Development			1	2	
	A.4. Healthcare ICT Planning		2	2	2	
	A.5. Architecture Design			1	1	1
	A.6. Application Design	2	1			
	A.7. Technology Trend Monitoring				2	2
	A.8. Sustainable Development			1	1	
	A.9. Innovating				3	
B. BUILD	B.1. Application Development	3	1	1		
	B.2. Component Integration			1	1	
	B.3. Testing	4			1	
	B.4. Solution Deployment	1	1			
	B.5. Documentation Production	1	1	1		
	B.6. Systems Engineering			2		
C. RUN	C.1. User Support	2	3			
	C.2. Change Support		2	1		
	C.3. ICT Service Delivery			2		
	C.4. Problem Identification & Management		2	2	1	
D. ENABLE	D.1. Information Security & Privacy Strategy Development				3	2
	D.2. ICT Quality Strategy Development				2	1
	D.3. Education & Training Provision		6	2		
	D.4. Purchasing		3	1		
	D.5. Sales Proposal Development		2	1		
	D.6. Channel Management			3		
	D.7. Sales Management			2	1	
	D.8. Contract Management		2	1	1	
	D.9. Personnel Development		3	3		
	D.10. Information & Knowledge Management			9	10	15
	D.11. Needs Identification			7	2	1
	D.12. Digital Marketing & Communication		3			
	D.13. Data Analysis, Modeling & Reporting	3	1	1		
	D.14. Standards & Interoperability Requirements Adoption		4	1		
	D.15. Healthcare ICT Infrastructure		5			
E. MANAGE	E.1. Forecast Development			3		
	E.2. Healthcare ICT Project Management		1	1	1	
	E.3. Risk & Compliance Management		2			
	E.4. Communication & Relationship Management			3	1	
	E.5. Process Improvement			3		
	E.6. ICT Quality Management		2		1	
	E.7. Healthcare Business Change Management			2	1	
	E.8. Information Security & Privacy Management		4			
	E.9. IS Governance				2	
	E.10. Financial & Account Management			1		
	E.11. Healthcare Services & Operations Management		3	4	1	1
	E.12. Healthcare ICT Legislation, Policy & Procedures Management		1	2	1	
F. USE	F.1. Communication & Integrated Healthcare ICT Solutions Usage	9	15	5	2	4
	F.2. Health Decision Support Solutions Usage			27	8	
	F.3. Patient Access & Engagement Assistance to ICT Usage	8	9	16		
	F.4. Electronic Records Management		17	10	13	
	F.5. Electronic Health Information Collection & Storage		17	15	6	
	F.6. Electronic Health Information Usage, Exchange & Sharing		20	10	9	

eHealth Competency Model with group selections - MIDWIVES

Dimension 1 COMPETENCY AREAS	Dimension 2 COMPETENCY	Dimension 3 PROFICIENCY LEVELS				
		1	2	3	4	5
A. PLAN	A.1. IS & Healthcare Strategy Alignment				3	
	A.2. Service Level Management			2	1	
	A.3. Healthcare ICT Strategy Development			2		1
	A.4. Healthcare ICT Planning		1	2		
	A.5. Architecture Design			3		
	A.6. Application Design	2		1		
	A.7. Technology Trend Monitoring				2	1
	A.8. Sustainable Development			3		
	A.9. Innovating				2	1
B. BUILD	B.1. Application Development	1				
	B.2. Component Integration					
	B.3. Testing		1			
	B.4. Solution Deployment			1		
	B.5. Documentation Production			1		
	B.6. Systems Engineering			1		
C. RUN	C.1. User Support	2				
	C.2. Change Support			1		
	C.3. ICT Service Delivery			1		
	C.4. Problem Identification & Management		1			
D. ENABLE	D.1. Information Security & Privacy Strategy Development				1	
	D.2. ICT Quality Strategy Development					1
	D.3. Education & Training Provision		2			
	D.4. Purchasing		1			
	D.5. Sales Proposal Development			1		
	D.6. Channel Management			1		
	D.7. Sales Management					1
	D.8. Contract Management		1			
	D.9. Personnel Development		1			
	D.10. Information & Knowledge Management			2	16	5
	D.11. Needs Identification			2	1	
	D.12. Digital Marketing & Communication				1	
	D.13. Data Analysis, Modeling & Reporting		1			
	D.14. Standards & Interoperability Requirements Adoption		1			
	D.15. Healthcare ICT Infrastructure			1		
E. MANAGE	E.1. Forecast Development			1		
	E.2. Healthcare ICT Project Management					1
	E.3. Risk & Compliance Management				1	
	E.4. Communication & Relationship Management			1		
	E.5. Process Improvement			1		
	E.6. ICT Quality Management				1	
	E.7. Healthcare Business Change Management			1		
	E.8. Information Security & Privacy Management				1	
	E.9. IS Governance				1	
	E.10. Financial & Account Management			1		
	E.11. Healthcare Services & Operations Management		1		2	
	E.12. Healthcare ICT Legislation, Policy & Procedures Management				1	
F. USE	F.1. Communication & Integrated Healthcare ICT Solutions Usage	7	2	5	7	5
	F.2. Health Decision Support Solutions Usage			11	9	
	F.3. Patient Access & Engagement Assistance to ICT Usage	5	6	9		
	F.4. Electronic Records Management		7	8	9	
	F.5. Electronic Health Information Collection & Storage		7	9	8	
	F.6. Electronic Health Information Usage, Exchange & Sharing		9	9	4	

eHealth Competency Model with group selections - PHARMACISTS

Dimension 1 COMPETENCY AREAS	Dimension 2 COMPETENCY	Dimension 3 PROFICIENCY LEVELS				
		1	2	3	4	5
A. PLAN	A.1. IS & Healthcare Strategy Alignment				2	
	A.2. Service Level Management					
	A.3. Healthcare ICT Strategy Development			1		
	A.4. Healthcare ICT Planning			1		
	A.5. Architecture Design					
	A.6. Application Design					
	A.7. Technology Trend Monitoring					
	A.8. Sustainable Development			1		
	A.9. Innovating					
B. BUILD	B.1. Application Development					
	B.2. Component Integration					
	B.3. Testing	1	1			
	B.4. Solution Deployment		1			
	B.5. Documentation Production	1		2		
	B.6. Systems Engineering					
C. RUN	C.1. User Support	2				
	C.2. Change Support		1			
	C.3. ICT Service Delivery		1			
	C.4. Problem Identification & Management		1			
D. ENABLE	D.1. Information Security & Privacy Strategy Development					
	D.2. ICT Quality Strategy Development					
	D.3. Education & Training Provision		2	2		
	D.4. Purchasing					
	D.5. Sales Proposal Development					
	D.6. Channel Management					
	D.7. Sales Management			1		
	D.8. Contract Management					
	D.9. Personnel Development		1	3		
	D.10. Information & Knowledge Management			8	13	7
	D.11. Needs Identification					
	D.12. Digital Marketing & Communication					
	D.13. Data Analysis, Modeling & Reporting					
	D.14. Standards & Interoperability Requirements Adoption					
	D.15. Healthcare ICT Infrastructure					
E. MANAGE	E.1. Forecast Development					
	E.2. Healthcare ICT Project Management		1	1		
	E.3. Risk & Compliance Management					
	E.4. Communication & Relationship Management			1		
	E.5. Process Improvement					
	E.6. ICT Quality Management					
	E.7. Healthcare Business Change Management					
	E.8. Information Security & Privacy Management					
	E.9. IS Governance					
	E.10. Financial & Account Management					
	E.11. Healthcare Services & Operations Management		1			
	E.12. Healthcare ICT Legislation, Policy & Procedures Management					
F. USE	F.1. Communication & Integrated Healthcare ICT Solutions Usage	11	6	6	5	1
	F.2. Health Decision Support Solutions Usage			22	6	
	F.3. Patient Access & Engagement Assistance to ICT Usage	4	14	8		
	F.4. Electronic Records Management		21	3	4	
	F.5. Electronic Health Information Collection & Storage		20	6	3	
	F.6. Electronic Health Information Usage, Exchange & Sharing		17	8	3	

Appendix B: Analysis of Survey Results

About You

In this section some preliminary questions were asked to determine the participant profile.

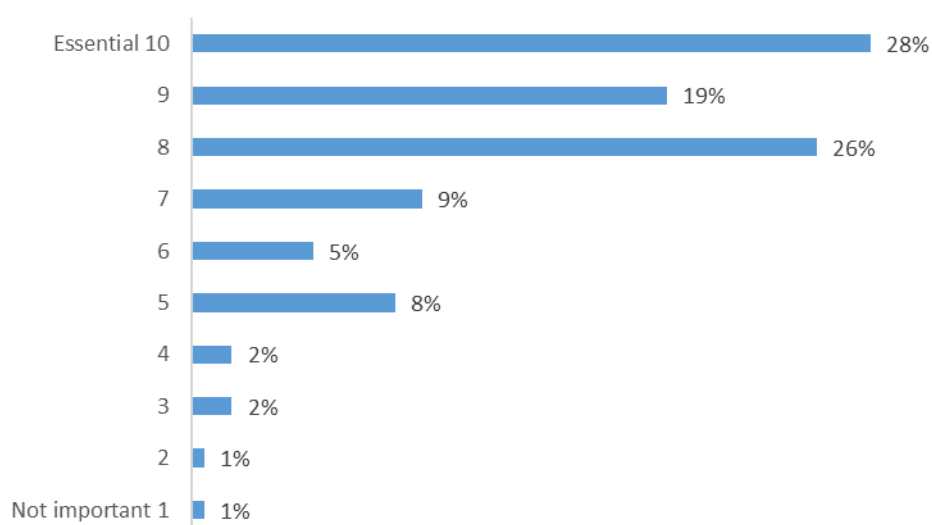
Category	Responses	Gender		Age					Number of years since graduating from university/training					Did you receive any e-skills training as part of your primary degree/training, to achieve your qualification?	
		Female	Male	20-29	30-39	40-49	50-59	60-69	0-5	5-10	10-20	20-30	>30	No	Yes
Nurses	48	44	4	6	16	19	6	1	10	9	14	10	5	22	26
Midwives	40	40		6	9	13	12		5	5	11	14	5	22	18
Doctors	39	23	16	6	10	7	12	4	6	8	9	9	7	17	22
Dentists	22	16	6	5	8	4	4	1	5	7	4	4	2	12	10
Pharmacists	31	26	5	15	6	5	5		13	6	4	5	3	22	9
Totals	180	149	31	38	49	48	39	6	39	35	42	42	22	95	85

Number of years since graduating from university/training	Did you receive any e-skills training as part of your primary degree/training, to achieve your qualification?			
	No	%	Yes	%
>30	18	82%	4	18%
20-30	22	52%	20	48%
10-20	20	48%	22	52%
5-10	16	46%	19	54%
0-5	19	49%	20	51%
	95	53%	85	47%

e-Skills for Professionals

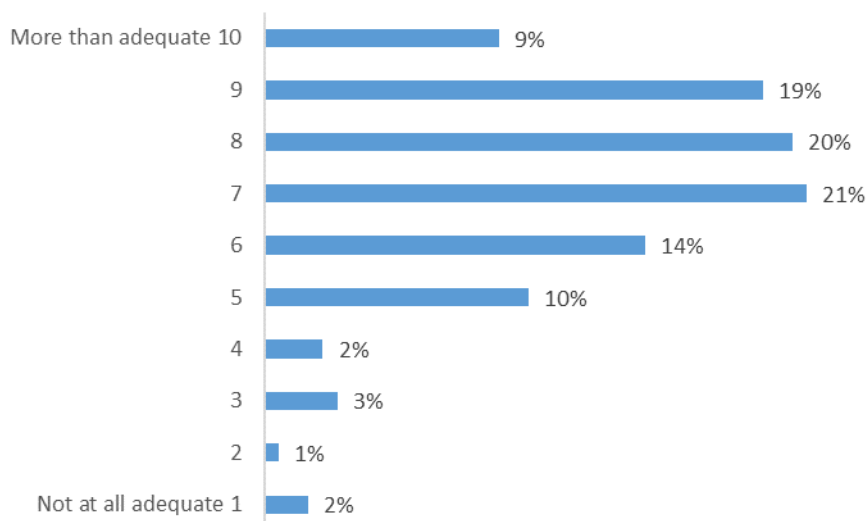
In this section questions were asked about opinions on e-skills in a healthcare setting.

How important is having e-skills in your role?



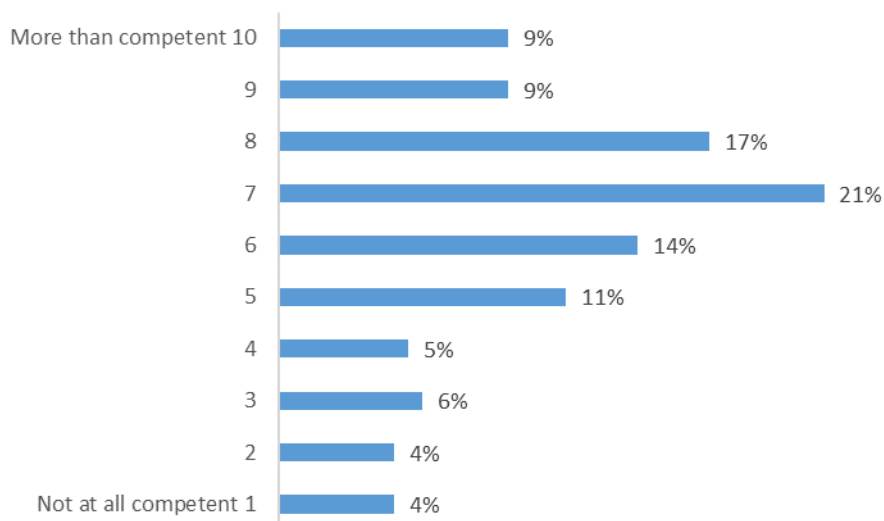
(n=180)

Do you feel your current level of e-skills competence is adequate to perform your role?



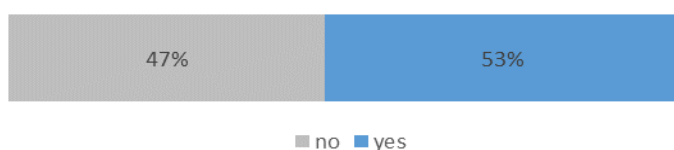
(n=180)

Do you feel competent to assist patients in accessing e-Health information and services?



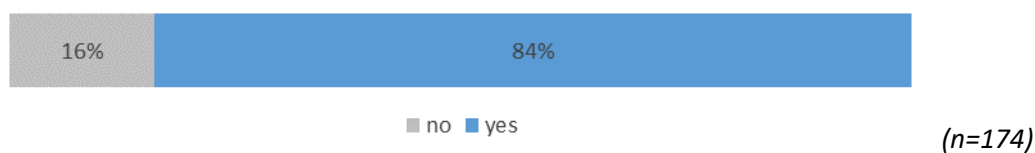
(n=180)

Do you feel that you are sufficiently supported at work to help you improve your e-skills?



(n=174)

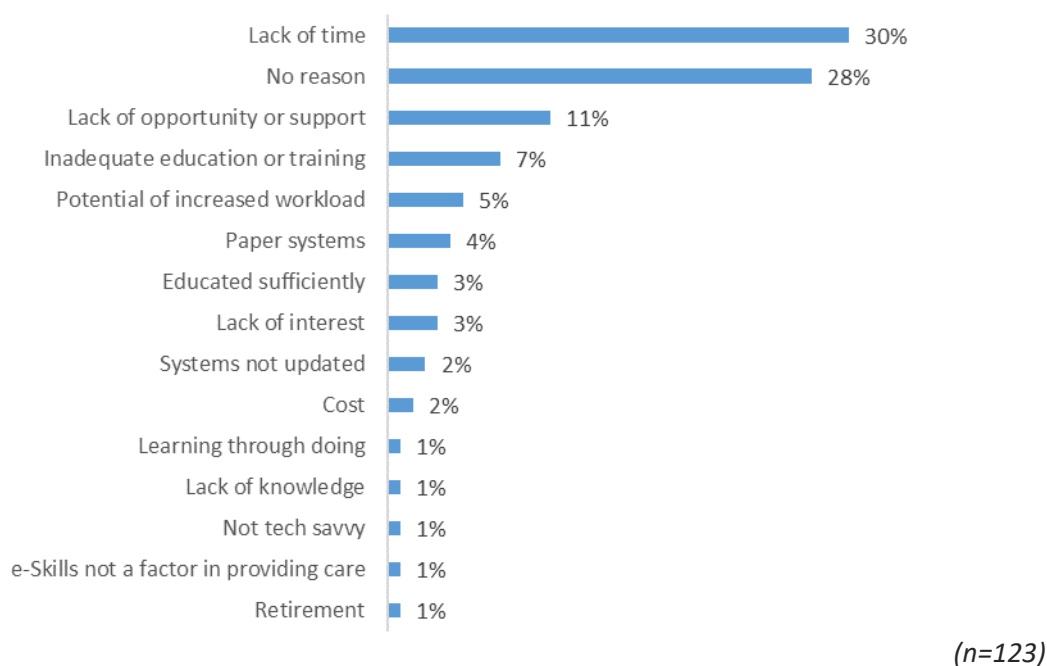
Do you feel motivated to improve your e-skills?



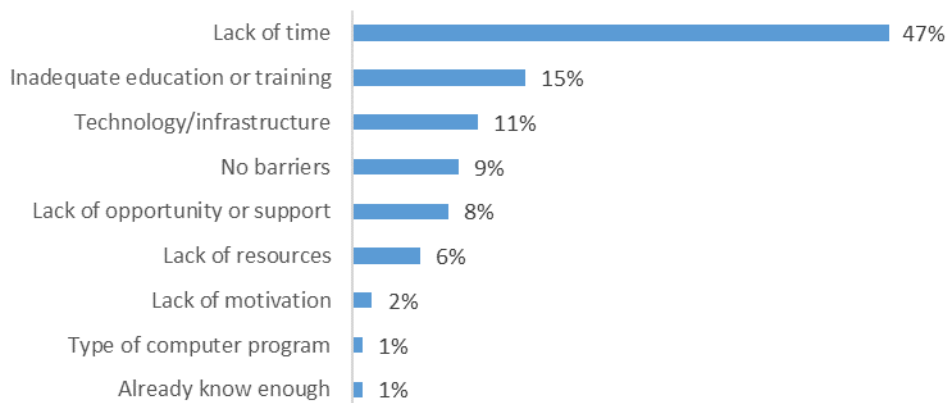
What would be the main motivating factors for you to improve your level of e-skills competence in your job?



What would be the main reasons for you not to improve your level of e-skills competence in your job?

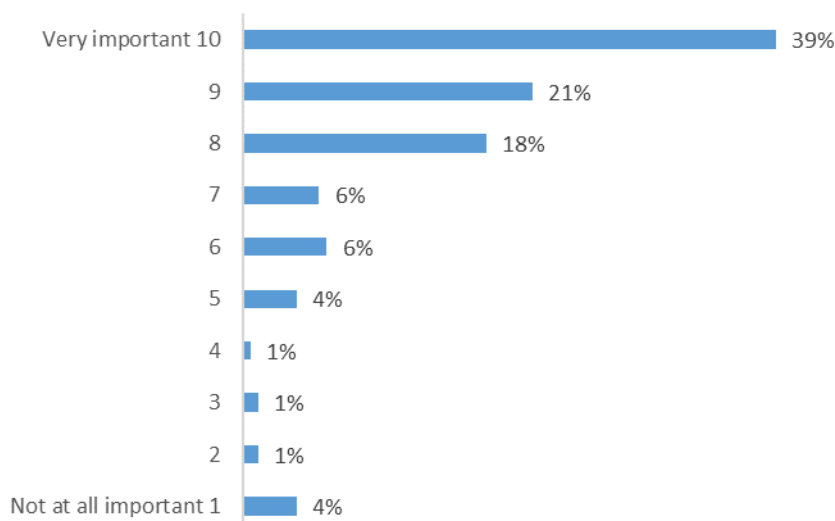


What are the barriers to improving your e-skills competence in your job?



(n=119)

How important do you consider having adequate e-skills is for career advancement?

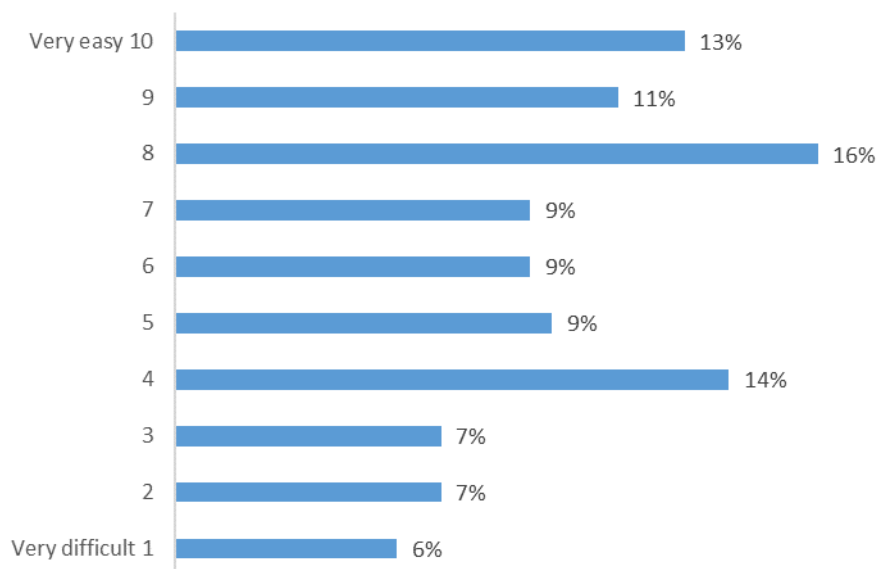


(n=180)

About the competence self-assessment exercise

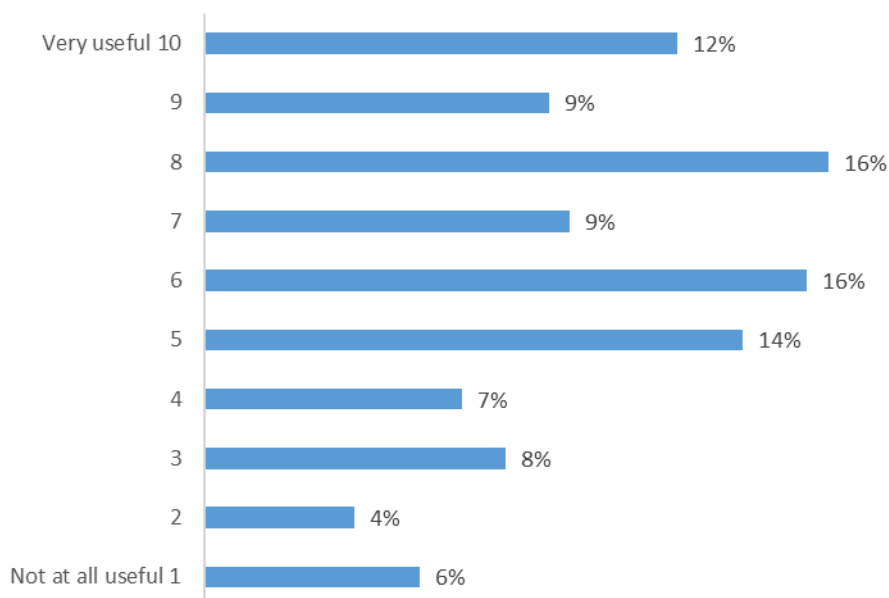
In this section questions were asked about participants' experiences in the pilot and completing the self-assessment exercise.

Was the online tool easy to use?



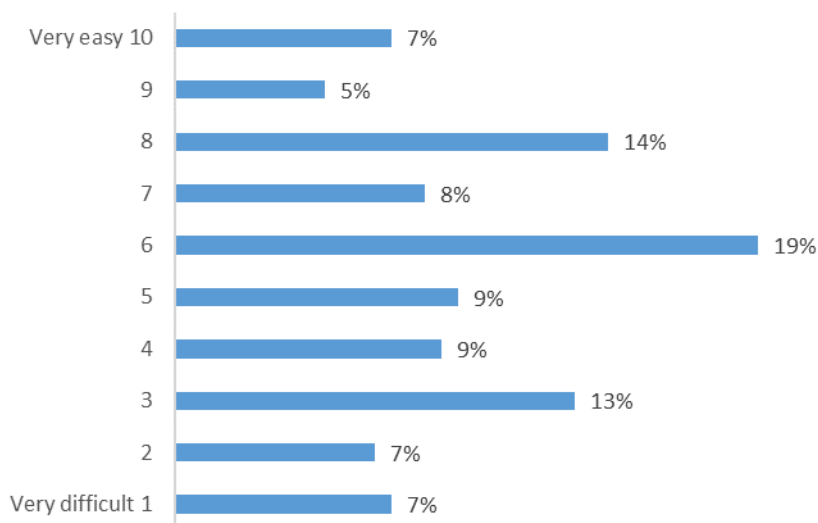
(n=180)

How useful was the guidance information provided to you?



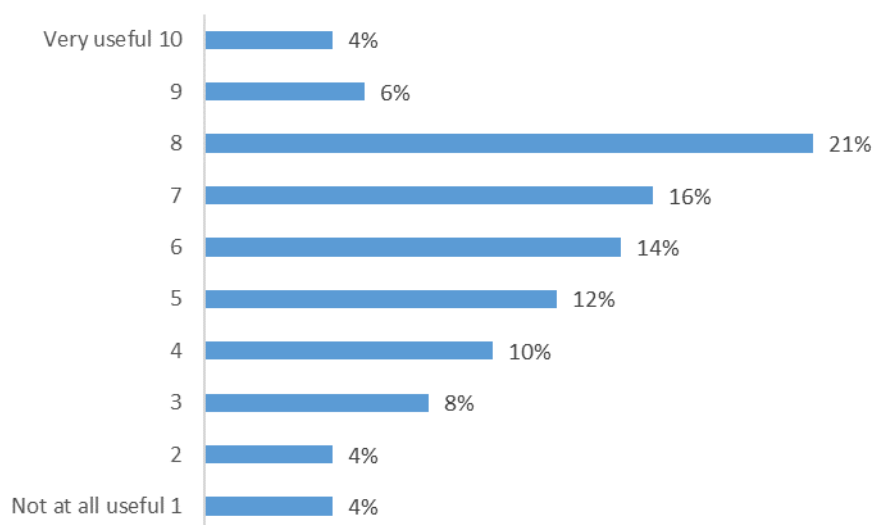
(n=180)

How easy was it to describe the competences as described?



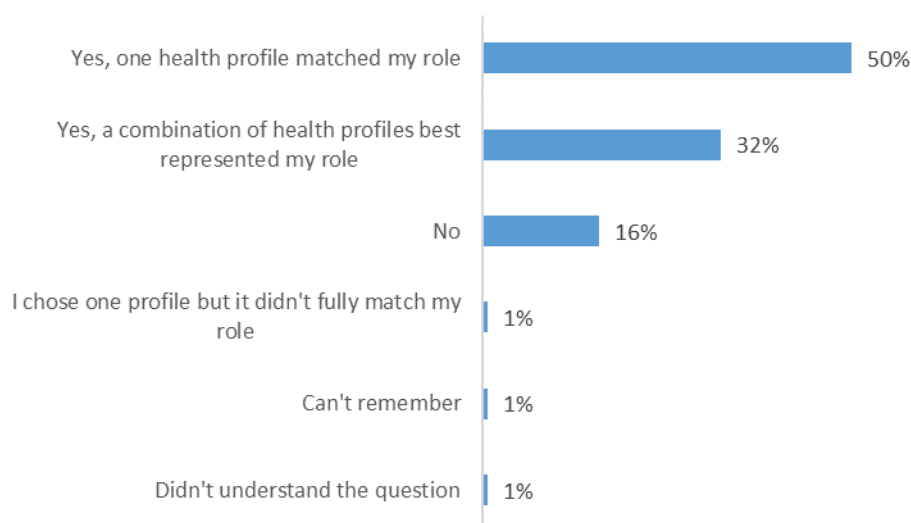
(n=180)

How helpful were the additional knowledge and skill items in understanding the competences?



(n=180)

Were any of the seven health profiles and obvious match to your role?

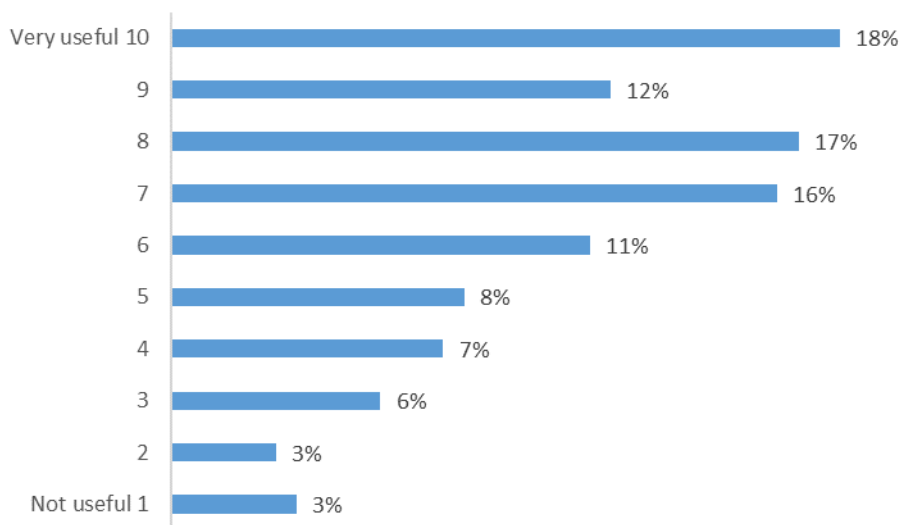


(n=158)

Are there any health profiles missing from the tool?	
No	16
Don't know	3
Nurse	2
Pharmacist not in a patient-facing role	2
College educated nurses	1
Doctor/dentist	1
Healthcare community nurses	1
Frontline nursing and medical staff at ward level	1
Nurses and midwives	1
Other health professionals that deal with patients	1
Pharmacist	1
Pharmacist Technician	1
Pharmacist working in a community pharmacy	1
Public Health Information Specialists	1
Profiles are not full adapted to the Portuguese situation	1
Resident physician	1
	(n=34)

Are there e-skill competences missing from the tool?	
No	15
Don't know	8
Yes	1
Possibly	1
Data configuration e.g. master data within an application, development of datasets for use in e-health projects	1
Safeguard of healthcare electronic record, usage of healthcare electronic record, usage of alternatives to electronic record	1
	(n=27)

Did you find the competence self-assessment exercise useful?



(n=180)

Would you recommend completing a competence self-assessment exercise to a friend/colleague/manager?



(n=165)

Appendix C: Stakeholder Interviewees

Panayiotis Yiallourous	Professor of Pediatrics, UCY	Cyprus
Costas Pattichis	Professor of Department of Computer Science, UCY	Cyprus
Minas Kyriakides	ICT Coordinator for the Ministry of Health	Cyprus
Outi Ahonen	Senior Lecturer, Project Manager	Finland
Jarmo Reponen	Professor of Occupational Health; Health IS	Finland
Lilli Väisänen	Social and health care provider, digitisation and customer experience	Finland
Paul De Rave	EFN Secretary General	Belgium/EU
Ken Biswell	Private Hospital CFO	Ireland
Neil O'Hare	Professor of Health Informatics/Hospital Group CIO	Ireland
Loretto Grogan	Director of Nursing and Midwifery	Ireland
Pamela Hussey	Health Informatics Lecturer	Ireland
Elena Ramelienė	Head of Methodology and Curriculum Development Unit at a Healthcare and Pharmaceutical Competence Centre	Lithuania
Evaldas Bačiulis	Interim Head of IT department at University of Health Sciences Kaunas Clinics	Lithuania
Rolandas Bėrontas	Head of IT division at Vilnius University Hospital Santaros Clinics	Lithuania
Linas Kavolius	Advisor for eHealth information technology coordination and implementation in the Ministry of Health	Lithuania
Dr. Kulja András	Resident Surgeon	Hungary
Fruzsina Mezei	Senior Health Policy Expert in a Primary Care and Chronic Care Project	Hungary
Micaela Seemann Monteiro	Chief Medical Officer for Digital Transformation	Portugal