Faculty of Clinical Informatics

Development of Core Competencies for Clinical Informaticians in the United Kingdom

Report C.   Phase 1 Report – Consultation Exercise and Output Competences for a Clinical Informatician (v1.1)

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17/3/2020

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1. FCI Core Competencies Project – scope and rationale

1.1 Overview

The Faculty of Clinical Informatics (FCI) was established in March 2017 to support the needs of Clinical Informaticians (CIs) in the United Kingdom (UK). The FCI vision(1) is; *"To support safe, effective and efficient health and social care to the public through the promotion and encouragement of the study and practice of the science of clinical informatics"*.

Two overarching aims for the FCI at its inception were to;
- Develop professional competencies for clinical informaticians.
- Provide accreditation for informatics-based training programmes

The vast scope and range of activities covered by clinical informatics sometimes makes it hard to provide a short and pithy description of what we do and who we are, when challenged to do so. The Core Competencies Project (CCP) was set up to help the FCI meet this challenge and set out the core competencies required for an individual to be recognised as a professional clinical informatician.

At some stage the FCI will also need to consider the wider training needs in informatics for all clinicians at undergraduate and postgraduate level, and the minimum and desirable competencies they must have, whatever career pathway they choose. That is out of scope for this project but will need to be addressed in the near future.

The CCP provides a methodology for the development of core knowledge and skills-based competencies for CIs and the mechanism by which these competencies can be mapped to educational and professional developmental initiatives for accreditation. Evidence that an individual has achieved these core competencies should qualify that person for membership of the FCI.

1.2 Project Aims

I.   Develop core knowledge and skill-based competencies required for UK-based CIs.
   a. Develop, test and define the output core competences required of a professional clinical informatician (phase 1)
   b. Define the core skills, knowledge and traits that constitute the core (input) competencies to enable an individual CI to do the job. (phase 2)
II. Develop a process for accrediting informatics educational applications through the FCI. (phase 3)

Phase 1 of the CCP was undertaken directly by the FCI project team and is presented as three linked reports:
A. *Discovery stage*: Develop and define the professional attributes of a clinical informatician – final report (v1.1) [Report A]
B. *Validation stage*: Phase 1 Report - Validation Study and draft Output Competences for a Clinical Informatician (v1.1) [Report B]

C. *Consultation stage*: Phase 1 Report – Consultation Exercise and Output Competences for a Clinical Informatician (v1.1) [This Report C]

1.3 Method

The key task of phase 1 of the CCP was to define the output competences[1] we expect of care professionals working as CIs in the UK. Drawing on the expertise of the multi-professional membership of the FCI we used a mix of qualitative methods to derive and refine the list of output competences. Outputs from this phase of the project will then be used in phase 2 of the CCP to define the skills, knowledge and traits that are required to enable the individual clinical informatician to develop their careers and do their job – *the core input competencies*, testing and developing these with key stakeholders as we go[2]. This framework will be used to develop a systematic mapping process which the FCI can use to accredit educational CI applications (phase 3) – see the project plan (figure 1) below.

Figure 1.

CCP Project Plan			
Phase	**Led by**	**Date**	**Objectives**
Phase 1	FCI CCP team		Develop, test and define the output core competences required of a professional clinical informatician
A		Jul-19	Develop and define the professional attributes of a clinical informatician
B		Nov-19	Report Validation Study and draft Output Competences for a Clinical Informatician
C		Feb-20	Final report on output competences after consultation
Phase 2	UoM		Define the core skills, knowledge and traits that constitute the core (input) competencies to enable an individual CI to do the job
1			A systematic literature review, content analysis and subsequent thematic analysis
2			Develop a competency framework
3			Evaluate the framework via expert consultation (semi-structured interviews)
4		Apr-20	Refine framework & seek wider evaluation via survey
Phase 3	UoM / FCI	May-20	Develop a process for accrediting informatics educational applications through the FCI

Key UoM = University of Manchester

The second (main) phase of the project is a systematic review to identify literature-based competencies from recognised databases and the grey literature[3]. Expert opinion, gathered through semi-structured interviews and surveys, will identify expert derived competencies, omissions from and clarifications on the literature competencies in addition to determining the pragmatic scope of the competencies applicable to CIs working across UK health and

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[1] Competence may be defined in terms of what the individual brings to the job (the input), what the individual does in the job (the process), or what is actually achieved (the output).

[2] 'Core' in this context denotes the minimum knowledge base that all CIs must have to be eligible to become members of the FCI and excludes further sub-specialist avenues of education.

[3] Grey' literature can be defined as 'materials and research produced by organisations outside of the traditional commercial or academic publishing and distribution channels'.

care. The resultant documents and transcripts will be analysed to identify and group the competencies.

The methodology for this project has been developed with expert academic advice from Dr Lydia Jidkov, Prof. Trish Greenhalgh and Prof. Georgina Moulton. The CCP is being undertaken jointly by the FCI and the University of Manchester.

1.4 Core Competencies Project (CCP) Progress – Phase 1

Our first report (Report A) set out to develop and describe what we tentatively called the *professional attributes* of a clinical informatician. Report A presented:

I. Evidence based definitions for clinical informatics and clinical informaticians, and professional attributes of clinical informaticians in the UK
II. The methodology adopted to develop the definitions and professional attributes
III. Recommendations for further work

The validation stage of phase 1 (Report B) was undertaken as a semi-structured questionnaire, sent to a second (different) deliberative sample of FCI members, extending the criteria to try to ensure we continued to reflect the expanding membership of the faculty and including members of the public.

Throughout Phase 1 of the project, we have considered several definitions / descriptions of clinical informatics, starting with the FCI's strapline from the Faculty vision[1]:

Our vision: Safe, effective and efficient health and social care achieved through the best use of information and information technology.

AMIA's description[2] of clinical informatics is even simpler:

Clinical Informatics is the application of informatics and information technology to deliver healthcare services.

In Report A, we offered a modified definition of the Cambridge Clinical Informatics Group (CCIG)[3] definition of clinical informatics.

Clinical Informatics is the interdisciplinary study of data, information and computing technology (ICT) and communication with respect to human health and wellbeing; including understanding, developing, integrating, applying, evaluating and closing ICT innovations to advance comprehension of human health and wellbeing, and the delivery of health and social care.

In Report B we offered a description of clinical informatics based on the definition of person-centred care suggested by the Health Foundation[4] that keeps the person / patient / service-user at the centre of our considerations, which we tested in this consultation, as Statement 2:

Clinical Informatics involves embracing the benefits of information technology with respect to health and wellbeing to advance treatment and the delivery of personalised, coordinated support from health and social care.

1.5 Next steps

The findings of the validation survey and draft output competences for clinical informaticians from Reports A & B were presented to a wider group of FCI experts and advisers for further review, revision and consideration. This was done through a consultation exercise with Faculty members, the wider health informatics community and key stakeholders in the form of an online survey. The results of that consultation are presented here as Report C.

The outputs from phase 1 of the CCP will inform and underpin the systematic literature review (phase 2) of the project and will themselves be revised and updated as the project progresses in an iterative way. Phase 2 of the project is being undertaken by the Univ. of Manchester (UoM) under Prof Georgina Moulton, who has close ties with Health Education England, Connected Health Cities & Health Data Research UK. We expect a final report on the CCP (phases 2 & 3) by the end of April 2020, which will mark the completion of the project.

2. The consultation exercise (online survey)

2.1 Approach

The FCI held a consultation on the CCP Phase 1 findings (presented in reports A & B) on the Faculty website between 3rd December 2019 and 20th January 2020[5]. We used a convenience sample of FCI members and the FCI's internal Key Stakeholder list. FCI members were informed by email and through faculty channels about the survey and invited to respond individually and spread the word through their professional networks. Organisations on the FCI's key stakeholder list were contacted once by email to notify them of the consultation and invited to participate. The survey was also open to individuals and organisations not specifically identified as members or key stakeholders. Responses were limited to one per individual and one per organisation. We aimed for between 60-100 responses to ensure breadth of response and allow enough information for key themes to emerge. We aimed to repeat the recruitment process two weeks and one week before the survey closed to ensure we had at least 60 responses.

The consultation was in the form of an online survey (see Appendix B), gathering respondent background information then testing each of the seven statements presented in Report B (as below) by asking respondents to state their level of agreement or disagreement on a five-point Likert scale (from strongly disagree through disagree, neither agree nor disagree, agree to strongly agree). No questions were compulsory. Respondents were invited to provide additional comments in a text box to clarify their score. At the end of the survey, there was a final open question, inviting respondents to add any other general comments. In all the survey asked 21 questions.

The seven statements from Report B that were tested in this consultation are listed below:

> **Statement 1**
> *Firstly, and fundamentally, we are describing a landscape occupied by professional clinicians who are also informaticians. So, the first criterion is that a clinical informatician must be a health or care professional registered with one of the regulators overseen by the Professional Standards Authority to be eligible for full membership or fellowship of the FCI.*

> **Statement 2**
> ***Clinical Informatics*** *involves embracing the benefits of digital technology with respect to health and wellbeing to advance treatment and the delivery of personalised, coordinated support from health and social care.*

> **Statement 3**
> ***A clinical informatician*** *uses their unique knowledge and experience of informatics concepts, methods and tools to promote care that is safe, effective, efficient, timely, person centred and equitable.*

> **Statement 4**
> *It seems essential to us that clinical informatics is fully inclusive of the range of professionals and skills needed to meet the challenges of supporting health and well-being in the twenty-first century.*

> **Statement 5**
> *The set of **Principles** presented and tested in Phase 1 of the CCP study seem to be generally well supported by respondents. Clinical informaticians operate across the whole cycle of information processes, programmes, products and projects, bringing benefit to people and users at service, system and population levels.*

> **Statement 6**
> *The set of **Areas** that describe the scope of clinical informatics are also well-supported, alongside the additional areas suggested by respondents including; inter-operability, clinical safety, leadership and clinical engagement. There was a clear recognition that 'big data'', population medicine and data analytics skills are valuable clinical informatics tools, key to improving health outcomes.*

> **Statement 7**
> *The set of **Professional attributes** were strongly supported by respondents and seem to be key components of clinical informatics practice.*

3. Findings

3.1 Q1-6 Respondent background and demographic information.

Overall, there were 118 responses to the consultation from 21 organisations and 97 individuals. The professional backgrounds of respondents are shown below in table 1 and a list of responding organisations is shown in table 2. One organisation provided a written response to the survey, agreeing with the Phase 1 findings and general statements. This is recorded as "not answered" in the responses to the individual statements in 3.2 below.

Table 1 – Respondents by professional speciality

Doctor	44	Nurse	21
Allied HP	17	IT professional	13
Pharmacist	8	Professional body	6
Knowledge / info services	2	Clinical scientist	2
Analyst	1	Researcher	1
Consultancy	1	Data Protection Officer	1
Chief Info Officer	1	Total	118

Table 2 –Organisations responding to the consultation

1. Aneurin Bevan University Health Board
2. Cerner
3. Chief AHP Office NHSE/I
4. Dovetail Labs (EMIS)
5. Health and Care Professions Council
6. Isle of Man DHSC
7. Manchester Royal Eye Hosp.
8. National Care Forum
9. NHS Digital Academy
10. Oxfordshire CCG
11. Private company (not specified)
12. Royal College of Pathologists
13. Royal College of Radiologists
14. Royal College of Occupational Therapists
15. Royal College of Occupational Therapists (Children & Young People's Forum)
16. Royal College of Paediatrics and Child Health
17. Royal College of Physicians
18. Royal College of Speech and Language Therapists
19. Social Care Institute for Excellence
20. The Royal Pharmaceutical Society
21. Wirral Community Health & Care Trust

Of the 97 individual responses, 62 (64%) were from fellows, members or associates of the FCI and there were 35 (36%) individuals were not associated with the FCI (Figure 2 below).

Figure 2.
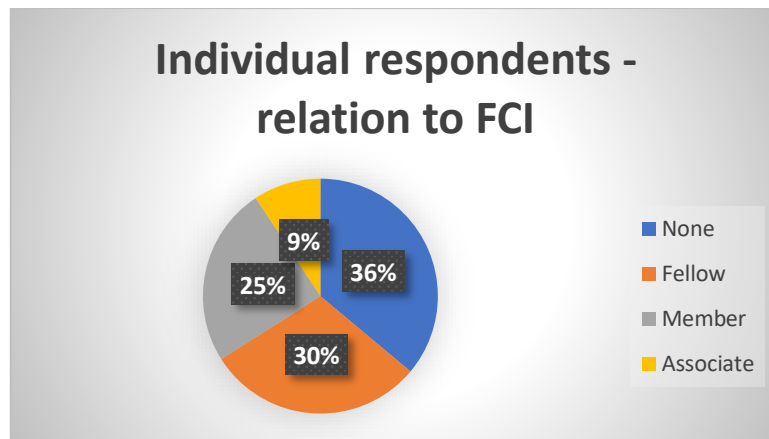
3.2 Testing each of the seven statements – statement *1*

Statement 1- Q7 & Q8 of the survey
Firstly, and fundamentally, we are describing a landscape occupied by professional clinicians who are also informaticians. So, the first criterion is that a clinical informatician must be a health or care professional registered with one of the regulators overseen by the Professional Standards Authority to be eligible for full membership or fellowship of the FCI.

There were 117 responses to Q7 asking respondents to state their level of agreement or disagreement with Statement 1. 98 (84%) of the respondents agreed or strongly agreed with the statement. The breakdown of responses is shown below in figure 2.

Figure 3.

Q7. Statement 1 responses

Response	Count
Strongly agree	67
Agree	31
Neither agree nor disagree	8
Disagree	8
Strongly disagree	3
Don't know	0
Not answered	1
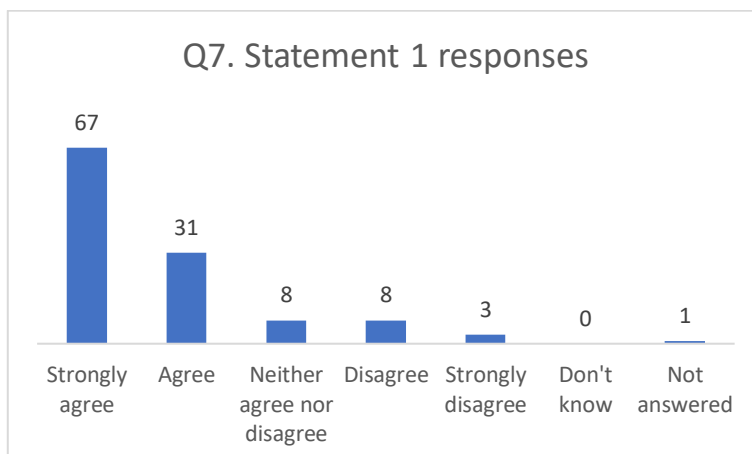
There were 61 detailed comments in relation to Statement 1, provided as responses to Q8 of the survey. Detailed analysis of the responses to Q8 reflected strong support for clinical informaticians to be registered and regulated health or care professionals, with respondents emphasising the multi-professional nature of clinical informatics as an area of clinical activity. Five respondents suggested that the FCI should not exclude clinicians who are no longer professionally registered but are working in an informatics role where their clinical background may provide invaluable insights. There were 12 other comments on the theme of inclusivity and ensuring clinical informaticians recognise and are able to work effectively with non-registered health informaticians and that the FCI finds a way to support such individuals through some form of associate membership and joint working with other professional bodies and groups.

1. *"To have the respect of the clinicians in this role, then they should be a professional in health or care."*
2. *"I agree that a clinical informatician should be a healthcare professional registered with a regulator."*
3. *"This is the whole point. We need clinicians at top levels in digital health alongside technicians."*
4. *"Why does the healthcare professional still need to be registered with a regulator? What if they were GMC registered in the past but no longer practising?"*
5. *"I have noticed that while there are a handful of practicing clinicians who also specialize in data analysis, there is a much larger number of them who have left their clinical careers behind. Nevertheless, their clinical experience is invaluable to their day-to-day operations as data analysts."*
6. *"We should aim to be inclusive of the diversity of workforce that works within the NHS and wider health sector."*
7. *"This should apply to all informaticians - clinical and non-clinical."*
8. *"Makes sense. Could be an associate membership for others."*

3.3 Testing each of the seven statements – statement 2

> *Statement 2 – Q9 & 10 of the survey*
> ***Clinical Informatics*** *involves embracing the benefits of digital technology with respect to health and wellbeing to advance treatment and the delivery of personalised, coordinated support from health and social care.*

There were 117 responses to Q9 asking respondents to state their level of agreement or disagreement with Statement 2. 102 (87%) of the respondents agreed or strongly agreed with the statement. The analysis of responses is shown below in figure 3.

Figure 4.
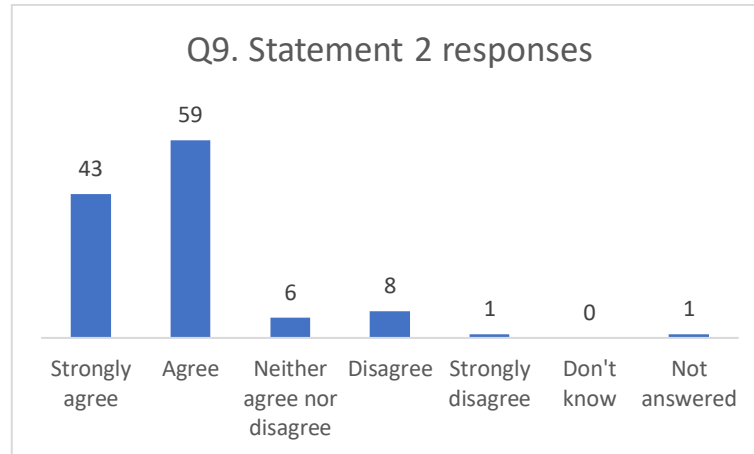
There were 45 detailed comments in relation to Statement 2, provided as responses to Q10 of the survey. Statement 2 is a definition of clinical informatics developed in the earlier stages of this project, to be inclusive of social care professionals who are registered with the Professional Standards Authority. Detailed analysis of the responses to Q10 indicated, that while this definition was supported by a large proportion of respondents, there were 31 suggestions about how the definition could be improved, some saying it should be more inclusive and others suggesting simplifying it further. Some respondents suggested that the statement should be more clearly focused on the individual patient or service user. Overall, the detailed responses suggest we could improve the definition of clinical informatics. We explore this further in sections 4 and 5.

9. *"The general definition seems appropriate. However, the term 'clinical informatics' will be challenging for the social work and social care sector. The term 'clinical' instantly implies medical and health care rather than wider care and support."*
10. *"Ultimately, it's about improving patient outcomes."*
11. *"There is no mention of the person/patient/citizen."*
12. *"This definition would benefit from explicit inclusion of patients and service users as the ultimate benefits recipients of clinical informatics."*
13. *"Too woolly - especially "involves" and "embracing"*
14. *"The definition should be concise as this makes the meaning clear however this definition is different to the FCI one which is better."*
15. *"This is about using/sharing/implementing the technology as a tool to deliver better care."*
16. *"To me the focus of the statement should be on leadership, vision and safety in the advancement of personalised care."*
17. *"I think the phrase coordinated care more accurately describes the process undertaken than coordinated support."*

3.4 Testing each of the seven statements – statement 3

Statement 3 – Q11 & 12 of the survey
A clinical informatician *uses their unique knowledge and experience of informatics concepts, methods and tools to promote care that is safe, effective, efficient, timely, person centred and equitable.*

There were 117 responses to Q11 asking respondents to state their level of agreement or disagreement with Statement 3. 108 (92%) of the respondents agreed or strongly agreed with the statement. The analysis of responses is shown below in figure 4.

Figure 5.

Q11. Statement 3 responses
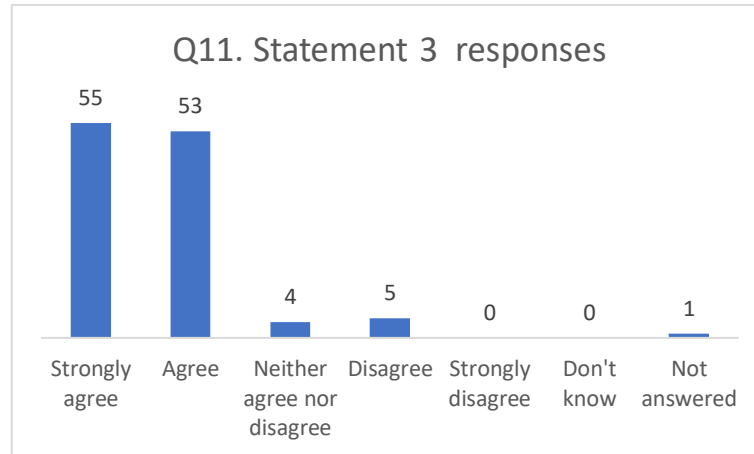
There were 39 detailed comments in relation to Statement 3, provided as responses to Q12 of the survey. Statement 3 is a definition of a clinical informatician developed through the earlier stages of this project. Most comments were broadly supportive but there were 27 suggestions about how the definition could be improved with 6 respondents recommending improvements to wording, particularly around the phrase "unique knowledge and experience" The importance of being both a clinician and informatician was emphasised by 4 respondents Other comments emphasised the need to include ethics, evidence-based practice and ensure the description covers both person-centred and population care. The importance of an international perspective is highlighted in the final comment below(6).

18. *"whilst I agree with the statement; I'm not sure that the 'unique' adds any value and would suggest removing it."*
19. *"Agree with the point about whether "unique" is the correct word. I suppose they mean it in the sense of a distinctive/ unusual *combination* of skills/knowledge? Seems to me that this could do with something explicit about evidence otherwise it's back to focussing on the technology."*
20. *"There needs to be reference to the informatician's clinical role and expertise, and the value that adds. It should reflect what is "clinical" about the clinical informatician role?"*
21. *"It seems clear that the title "Clinical informatician" spans a considerable spectrum of roles, it is perhaps a strand of some peoples work, but is the entire focus for others, which presents real challenges in terms of definitions. However, the principles of "less is more" adopted in the definitions of "clinical informatics" and "clinical informaticians" on pg27 of Report B seems to address this issue pretty well."*
22. *"The definition presented for consultation has removed the patient centred care experience. We would suggest it's important to reinstate the definition from the professional attributes document to reflect the duality of clinical and informatician identity, knowledge, experience and skills. This is the unique role of clinical informaticians in comparison with other informatician specialists."*
23. *"Clinical informatics should assist clinicians in giving optimal care to the patient in front of them, but also in improving the health and wellbeing of the population for whom they have responsibility."*
24. *"WHO quality definition is consistent with international standards and will make it more accessible."*
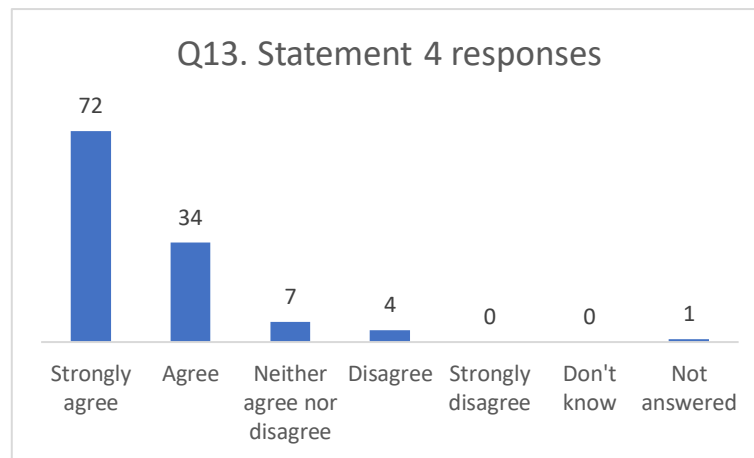
3.5 Testing each of the seven statements – statement 4

Statement 4 – Q13 & 14 of the survey
It seems essential to us that clinical informatics is fully inclusive of the range of professionals and skills needed to meet the challenges of supporting health and well-being in the twenty-first century.

There were 117 responses to Q13 asking respondents to state their level of agreement or disagreement with Statement 4. 106 (91%) of the respondents agreed or strongly agreed with the statement. The analysis of responses is shown below in figure 5.

Figure 6.

Q13. Statement 4 responses

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know	Not answered
72	34	7	4	0	0	1

There were 43 detailed comments in relation to Statement 4, provided as responses to Q14 of the survey. Statement 4 was designed to specifically address the inclusivity issue raised by respondents here and in our previous two reports. Overall, the statement was strongly supported, with an emphasis on multi-professional working and teamwork. However, there were 28 suggestions about how the statement could be improved, including several to make the statement less woolly and verbose.

The issue of who does or does not regard themselves as an informatician cropped up again here and has been a persistent theme throughout Phase 1 of the CCP. There were reminders to ensure that clinical informatics finds a way to be inclusive of patients, social care professionals and non-registered informaticians working in health and care.

25. *"We welcome this statement embracing clinical professional diversity in clinical informatics"*
26. *"We agree that it would be important not to narrow the definition, to ensure that it is inclusive and encompasses elements of the role which will evolve with future developments in technology."*
27. *"Clinical informatics should be fully inclusive of the disciplines that it intersects."*
28. *"Inclusivity is vital for clinical informatics to develop as a subspecialty (of any profession) and for clinical informaticians to work together on cross-service and multidisciplinary projects to identify clinical variation and improve quality of care and patient outcomes across the whole NHS."*
29. *"I had never considered myself to be a clinical informatician yet having read report A have discovered that I would definitely fall within that definition based on my existing roles. If people do not consider themselves to be CI's because of perceptions about narrow definitions and skill sets, we are likely to miss out on the valuable contribution of those who will not put themselves forward for this type of work."*
30. *"Have there been any calls for including patients somehow?"*
31. *"I wonder if here they are trying to acknowledge that as Clinical Informaticians they need to work in partnership with other Health Informatics professionals?"*
32. *"…should we emphasise "health and social care" professionals?"*

3.6 Testing each of the seven statements – statement 5
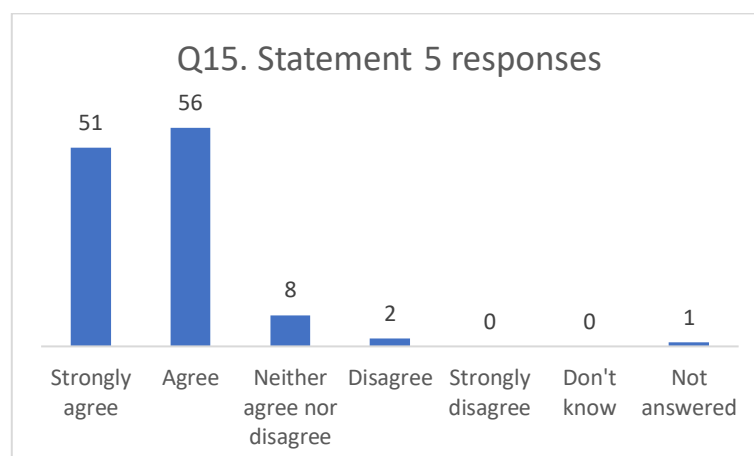
> **Statement 5 – Q15 & 16 of the survey**
> *The set of **Principles** presented and tested in Phase 1 of the CCP study seem to be generally well supported by respondents. Clinical informaticians operate across the whole cycle of information processes, programmes, products and projects, bringing benefit to people and users at service, system and population levels.*

These ***principles*** are described below:

a) **Purpose**: of clinical informatics is the improvement in the quality and experience of health and social care, and the areas of primary concern for clinical informatics are data[4], technology and communication.

b) **Inclusivity:** clinical informatics encompasses and gives equal weight to health and social care. It was felt that clinical informatics has been predominantly focussed on hospital and GP care, and been led by GPs and physicians. There was concern that the discourse continues to be health and physician/GP biased exacerbating the assumption that informatics is about healthcare and failing to recognise the involvement of teams, multidisciplinary and multiservice, as well as the involvement of patients, carers and family.

c) **Diversity**: clinical informatics is a diverse discipline and areas of focus vary greatly, e.g. developing Apps, guidance on information governance. Each area of focus is equally important to achieving the overall aim of better person-centred health and social care. One respondent reminded us not forget the human implications of diversity either.

d) **Interdisciplinary**: clinical informatics brings together learning from multiple disciplines. Disciplines involved in clinical informatics include social sciences, biology, ICT, computer science, data science, psychology, linguistics, engineering, statistics, mathematics, medicine, and many others.

e) **Whole cycle**: clinical informatics is concerned with the whole cycle of a process, programme, product, project, that is from inception to identifying improvements from evaluation and process shut down. Those working in informatics can operate at one or more parts of the cycle.

f) **Unit of operation**: Clinical informatics operates at service, system, and population levels and within organisational, developer, practitioner and end user culture. The benefits of clinical informatics are at the individual, service, system and population levels

There were 117 responses to Q15 asking respondents to state their level of agreement or disagreement with Statement 5. 107 (91%) of the respondents agreed or strongly agreed with the statement. The analysis of responses is shown below in figure 6.

Figure 7.

There were 47 detailed comments in relation to Statement 5, provided as responses to Q16 of the survey. In general, the detailed comments were supportive of the set of principles, but

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[4] "Data" may be too restrictive in this context, so this should be read as "data, information and knowledge".

there were 35 suggestions about how the principles might be improved in terms of style and content. Suggestions for terms to be added under the *principles* included; transparency, ethics, knowledge, education and evidence from research, but also concern that clinical informaticians should not be expected to be proficient in all these areas. Respondents commented again on the importance of a patient-centred and inter-disciplinary approach, with suggestions to include roles at a strategic as well as operational level and those working in the commercial sector as well as those in the national health and care system.

33. *"Include transparency as a principle."*
34. *"Perhaps it would be worth considering research & innovation in the principles."*
35. *"It is essential to incorporate knowledge and evidence from research not simply information."*
36. *"We welcome this set of principles. In particular, it is positive to see reference to the diversity of the field, in terms of the discipline and in recognition of the range of professional backgrounds clinical informaticians originate from."*
37. *"The value of an interdisciplinary approach is also captured by these principles."*
38. *"I am not involved in all areas. that makes me feel less I have less credibility as a result of this list."*
39. *"Our experts would prefer a stronger focus on patient at the centre- it does mention it, but it really should be the guiding principle."*
40. *"How are you inclusive of those clinical informaticians working for suppliers."*
41. *"There could be perhaps stronger wording within the principles that support the work of professionals working at a strategic level e.g. Professional bodies and those influencing policy. The current wording suits more operational roles."*
42. *"A higher emphasis on strategic working or CCIO/CNIO working at corporate level too within- or close to the healthcare board/executive function would be useful in statement 5."*

3.7 Testing each of the seven statements – statement 6

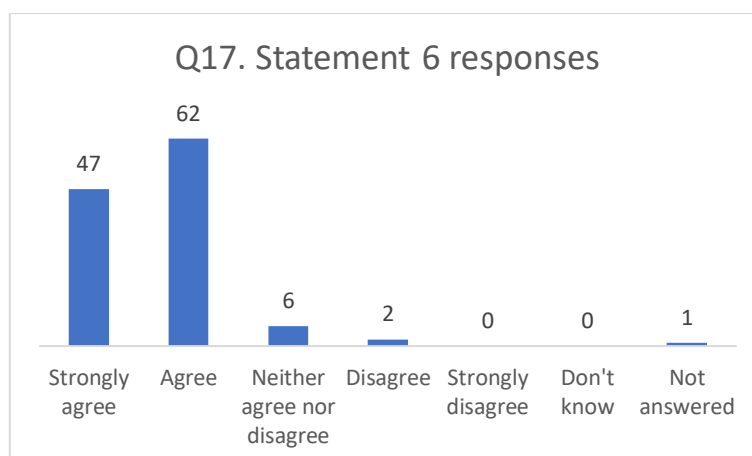> *Statement 6 – Q17 & 18 of the survey*
> *The set of **Areas** that describe the scope of clinical informatics are also well-supported, alongside the additional areas suggested by respondents including; inter-operability, clinical safety, leadership and clinical engagement. There was a clear recognition that 'big data", population medicine and data analytics skills are valuable clinical informatics tools, key to improving health outcomes.*

These *areas* are described below:

a) How people interface with ICT in health and social care, including electronic health and care record (EHCR) systems and person care portals
b) Methods to collect, manage, provide security for, and analyse clinical data and "big data"
c) Application of informatics across the lifespan in the multi-layered and complex context in which health and social care services operate
d) Interventions for clinical decision support, safety alerts, and data visualisation to facilitate optimal health and social care delivery
e) Innovative communications with those receiving care to facilitate their appropriate and informed use of health and social care provision
f) Ethical and information governance frameworks and data usage policies and procedures for assurance of high-quality ethical use of individuals' data.

There were 117 responses to Q17 asking respondents to state their level of agreement or disagreement with Statement 6. 109 (93%) of the respondents agreed or strongly agreed with the statement. The analysis of responses is shown below in figure 7.

Figure 8.

Q17. Statement 6 responses

There were 42 detailed comments in relation to Statement 6, provided as responses to Q18 of the survey. There were 38 suggestions for additional content under this heading including: patient engagement, leadership, system change, information governance, ethics, data sharing, strategy and policy formation. Implementation, evaluation and regulatory compliance and new areas, such as genomics and artificial intelligence were raised. Evidence-based practice, education and training were also suggested for inclusion.

43. *""Would have section focused on patient and user engagement and involvement, co-design and co-ownership."*
44. *"Missing domain in terms of leadership, development of others and succession planning"*
45. *"As a technical specialism that enables the wider system and embracing the unique attributes of clinical informaticians within the informatics community, clinical informatics includes a leadership role supporting the clinical community to engage with, develop and make best use of informatics as a clinical asset."*
46. *"We strongly agree that information governance frameworks and the ethical use of data are important components to reference."*
47. *"I would also add policy formation and strategy formation"*
48. *"Could we also add something about implementation of ICT - and the issues of clinical transformation as part of the process."*
49. *"Clinical decision support is mentioned here, but should there also be a mention of appropriate deployment and management of artificially intelligent systems, rather than strictly rule-based systems?"*
50. *"What role is there for Clinical Informaticians in the development, training, testing and validation of clinical AI?"*
51. *"The statements are high level which is ok at this stage. Difficult to disagree with any of them. Should genomics be mentioned?"*
52. *"However, there is a gap here - no explicit mention of "Evidence and Knowledge Management/Knowledge Mobilisation."*
53. *"The scope is clear and useful. We would suggest that it may be helpful for the scope to make reference to the education and training components of the discipline."*

3.8 Testing each of the seven statements – statement 7

Statement 7 – Q19 & 20
*The set of **Professional attributes** were strongly supported by respondents and seem to be key components of clinical informatics practice.*
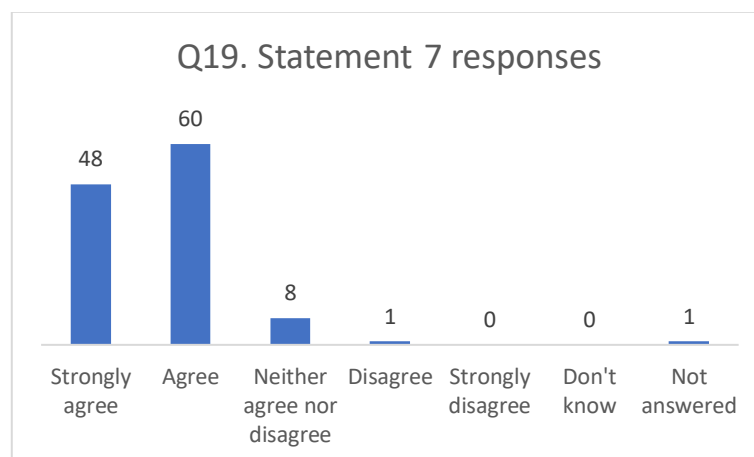
There were 117 responses to Q19 asking respondents to state their level of agreement or disagreement with Statement 5. 108 (92%) of the respondents agreed or strongly agreed with the statement. The analysis of responses is shown below in figure 8.

These *Professional attributes* are described below:

The clinical informatician works proactively (often in a leadership role), and collaboratively to:
a) **Define and prioritise** the needs of those receiving care and clinicians in informatics innovations (processes, systems, policies, products and programmes)
b) **Evaluate** the opportunities and limitations of informatics innovations (processes, systems, policies, products and programmes) in improving the quality of care delivery and experience
c) **Identify and take appropriate action** against ethical, legal, data protection and security risks
d) **Ensure** that informatics innovations (processes, systems, policies, products and programmes) are appropriate for the proposed purposes, that they are practical and implementable
e) Identify and address **clinical safety** issues
f) Ensure that **standards, guidance and best practice** are adhered to in clinical informatics

Figure 9.

Q19. Statement 7 responses

48	60	8	1	0	0	1
Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know	Not answered

There were 40 detailed comments in relation to Statement 7, provided as responses to Q20 of the survey. There were 34 suggestions to help improve clarity and definition of terms, but most comments were supportive. Leadership, ethics, change management and learning culture emerged as consistent themes as did the overlap with other senior informatics organisational roles Other comments stressed the importance of education, training and shared decision making with patients.

54. *"Excellent - well done!"*
55. *"Whilst the professional attributes are broad, these have been defined in a way that clearly explains what it means in the context of a clinical informatician."*
56. *"Our experts would add statements around ethics and managing conflict of interests. Again, teamwork and change management are crucial areas."*
57. *"Add commitment to lead, manage and evaluate programmes they are involved in and contribute to a learning culture in their domain."*
58. *"I think it is important to emphasise the "responsibilities" and "accountability" of clinical informaticians in the definition."*
59. *"it is also a process of clinical transformation - so issues around engagement, implementation etc are also important and possibly lost in these statements."*

60. *"wonder if there is another category - something about a responsibility to disseminate / share key lessons/findings - influence? if individuals are in a leadership role, which is implied, then my view is that this is also a responsibility of leaders."*
61. *"There is overlap with other IT roles e.g. clinical safety officer (CSO), Senior Information Risk Owner (SIRO) - while having these personal attributes are important; it is similarly important to recognise overlap."*
62. *"Are you including the CSO role into the CCIO role? What about the Caldicott guardian role?"*
63. *"We would again suggest that education and training would be an important component to reference in this statement."*
64. *"Shared decision making is an important professional attribute and going forward this mean that patients should be able to access their digital medical record and interface with it."*

3.9 Question 21 responses

Question 21 of the survey was an open "catch-all" question to provide respondents with the opportunity to make any other comments about Reports A & B or anything else they thought important to contribute.

Q21. *"Is there anything else you would like to add?"*. There were 39 responses to this question. Overall, there was strong support for the importance of the project and the work presented so far. Here and scattered throughout responses to other questions, mentions of ethics, change management, inclusivity and leadership appeared regularly. Respondents emphasised the importance of being patient-centred and clinical-safety focused, specifically relating to data quality, as areas of prime responsibility for clinical informaticians. The need to specifically include social care within clinical informatics came up regularly throughout the survey and there remain some concerns that the term "clinical informatics" is perceived as excluding social care.

65. *"This is an important piece of work. My genuine sense is that clinical informaticians need to influence the digital health agenda. We need to manage our health information better and ensure it follows the patient."*
66. *"Having read report A (and B) with great interest, it appears that much thought has gone into the process, resulting in an empirical accurate account of definitions and principles associated with Clinical Informatics. Having worked as a CCIO and CNIO in various healthcare settings in the last 10 years I would fully endorse report A and can fully identify and apply the definitions and principles in my role."*
67. *"Overall, we agree with the Phase 1 findings and the related statements."*
68. *"I found that my personal experience of working as a clinician in informatics correlated with a number of the key themes in report A & B. This leads me to believe that the descriptions of clinical informaticians attributes align with my personal belief of the role of a clinical informatician. I found significant value in both reports & appreciate the effort to progress to further phases of the project."*
69. *"Sounds very comprehensive, defining professional competencies and areas of application."*
70. *"Overall I think that this is good. The key element throughout is the explicit link with delivery of care and improvement in care."*
71. *"This is an exciting phase in healthcare, and I hope that this can translate readily into everyday care with the appropriate support from the state."*
72. *"This is a good start but quite high level and lacking in detail. There are many workstreams to clinical informatics, so it is good to define the scope and principles."*
73. *"I don't think we should try and re-invent the wheel here - clinical informatics for me is ultimately about using technology to achieve transformational change in the NHS."*
74. *"It may be worthwhile to mention how we see and relate to the broader health and biomedical informatics discipline."*
75. *"Clinical Safety should be at the forefront of everything clinical staff do."*
76. *"The key element throughout is the explicit link with delivery of care and improvement in care."*

77. *"Only to reiterate the point - Have there been any calls for including patients somehow?"*
78. *"Shared decision making is an important professional attribute and going forward this mean that patients should be able to access their digital medical record and interface with it."*
79. *"Systemic clinical safety issues are especially important…. so will be highly relevant for clinical informaticians."*
80. *"…add data quality here?"*
81. *"The concept of a clinical informatician is a valuable one. But it does need to encompass social work and social care."*
82. *"Work required to consult more widely with social care to make this more meaningful and inclusive."*
83. *"It is important that clinical informatics become a distinct area of endeavour but in trying to define what it is we need to maintain the inclusivity of the whole workforce, focus on the needs of the patient and clinician. Understand that it's about transforming how we deliver care whilst adhering to professional principles enshrined in documents such as Good Medical Practice from the GMC and similar documents from other regulatory bodies."*

3.10 Content analysis and emerging themes

Simple searches were created in the *Excel* worksheet holding all the response data, to examine the detailed text responses for commonly occurring words and phrases which were then analysed to identify themes in the text responses and are discussed below in section 4.

4. Synthesis

This section of the report brings together the findings from the whole phase 1 process to offer an analysis developed with input from the membership of the FCI, the wider informatics community, key stakeholders and members of the public.

Overall, the 7 statements tested in this consultation exercise all received strong support, but respondents highlighted improvements in presentation and gaps in content that should be addressed.

Key themes to emerge from the detailed textual comments received in the consultation were:
- The importance of the *health and care* professional aspects of being a clinical informatician with a clear focus on the patient / service user.
- *Technology* was also an important theme, providing the informatics component to clinical informatics
- *Inclusivity* – There were reminders to ensure that clinical informatics finds a way to be inclusive of patients, social care professionals and non-registered informaticians working in health and care.
- *Leadership* – in all its aspects, but with a responsibility to assure clinical safety
- The *science* of clinical informatics, including research, an evidence-based approach, education and training
- The *cultural* context of clinical informatics

These key themes should be clear in our output competences, to ensure descriptions of clinical informatics and clinical informaticians and the associated principles, areas and professional attributes, all adequately reflect the responses to this consultation.

There still remains some confusion about the "who" and "what" of clinical informatics. Throughout phase 1 it has been clear that there are many clinicians in informatics roles who are reluctant to call themselves clinical informaticians, though that is clearly what they do and who they are.

The responses to this consultation suggest strong support for the FCI's vision of clinical informatics as a discipline inclusive of health and care professionals who are registered and regulated through the Professional Standards Authority (PSA) in the UK. The output competences of clinical informaticians will help define the unique additional contribution of the clinical informatician.

Turning to the individual statements - statement 1 was strongly supported by respondents that a clinical informatician *must be* a health or care professional registered with one of the regulators overseen by the PSA. This statement has been very clearly endorsed by our members, key stakeholders and the wider informatics community. To be a clinical informatician first and foremost, you must be a registered and regulated clinician.

Health informatics is a broad church and respondents encouraged us to have some form of relationship with colleagues who are no longer registered and regulated clinicians, as well as the wider health informatics community. The FCI is the natural home for professional clinical informaticians i.e. those who are registered and regulated through the Professional Standards Authority. It is important that the FCI work alongside other professional bodies, recognising that there will be many shared pathways in terms of education, training, professional standards and development.

We have been consistently wary of definitions, which by their nature are inclusive of some aspects of clinical informatics but exclusive of others. We discussed in Report B how "less is more" in terms of being inclusive, given the vast scope and range of activities covered by clinical informatics, so there is a great deal of sense in keeping any description short, inclusive and consistent with the wider international community.

In view of this, we offer below a short *description* of clinical informatics as a revised Statement 2, rather than a formal definition. This is based on comments and feedback received throughout Phase 1 of the CCP, updated iteratively through each part of the project:

> *Clinical Informatics is the application of data and information technology to improve patient and population health, care and wellbeing outcomes and to advance treatment and the delivery of personalised, coordinated support from health and social care.*

We offer this description, knowing that it is incomplete, but that it is inclusive of health and care, is person-focused and links data and information to health and care.

The description of a clinical informatician we have used throughout Phase 1, has remained largely unchanged (bar removing the duplicate use of "person centred" in Report B) and was tested in this consultation as Statement 3:

A clinical informatician uses their unique knowledge and experience of informatics concepts, methods and tools to promote care that is safe, effective, efficient, timely, person centred and equitable.

This definition is also consistent with the NHS (and WHO) quality domains of; patient safety, clinical effectiveness and the experience of patients(7).

Building from Statement 1, first and foremost a clinical informatician needs to be both a registered clinician and a health informatician. To reflect this and emphasise the importance of person-centred care leads us to offer an updated description of a clinical informatician in a revised Statement 3, as set out below:

> *A clinical informatician* *uses their clinical knowledge and experience of informatics concepts, methods and tools to promote patient and population care that is person-centred, ethical, safe, effective, efficient, timely, and equitable.*

Once again, we accept that this description is incomplete, but it is inclusive of health, care and informatics with a focus on person-centred care. The wider dimensions of the clinical informatics landscape can be considered under the statements describing the set of principles and areas of clinical informatics practice and the professional attributes required of a clinical informatician.

A key theme to emerge was a reminder to ensure that clinical informatics finds a way to be inclusive of patients, social care professionals and non-registered informaticians working in health and care. To reflect feedback from the survey, we have removed "in the twenty-first century" and the rather ambivalent opening of the statement and offer an updated Statement 4 below:

> *It is essential that clinical informatics finds ways to work in collaboration and cooperation with patients, social care professionals and non-registered informaticians working in health and care.*

Statement 5 set out the set of principles that came to mind when clinical informaticians set out to describe the boundaries that distinguish clinical informatics as a professional discipline. In general, respondents were supportive of the set of principles, however, there were suggestions for additional content, including; transparency, knowledge and evidence from research.

The areas of clinical informatics described in Statement 6 represent the scope of clinical informatics practice. While these were well supported by most respondents, it was clear from this wider consultation that the list could usefully be extended to cover new areas of practice as well as improving style and clarity. From a competency framework perspective, we have previously described these areas as functional domains, that cover the scope of clinical informatics practice.

The set of professional attributes (*process competences[5]*) presented under Statement 7 were strongly supported in the consultation. These first emerged from the conversations in the context of definitions / descriptions in the first part of Phase 1 of the CCP and were presented in section 3.5 of Report A & strongly supported in Report B.

Leadership, change management, inclusivity and ethics all emerged again as important themes and the attributes have been revised slightly to reflect the comments from the consultation responses.

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[5] Competence may be defined in terms of what the individual brings to the job (the input), what the individual does in the job (the process), or what is actually achieved (the output).

Throughout this exercise and at each stage of Phase 1, time and again the main themes to emerge for clinical informaticians have been; around health and care, technology, leadership, inclusivity, science and culture. Many respondents emphasised the importance of being patient-centred and clinical-safety focused, as areas of prime responsibility for all clinical informaticians.

5. The output competences of a clinical informatician

The key task of phase 1 of the CCP was to define the output competences we expect of care professionals working as clinical informaticians in the UK.

Greenhalgh & Macfarlane (1997) have outlined the process for developing a competency grid for evidence-based medicine[8] and we have followed a similar process in this first phase of the Core Competencies project.

Competence may be defined in terms of what the individual brings to the job (the input), what the individual does in the job (the process), or what is actually achieved (the output). Thus, if the input is `green fingers', the process may be sowing, weeding and pruning, and the output a thriving garden or vegetable patch.

We now set out our view of what "clinical informatics competence" looks like. We present our findings and recommendations in terms of a set of revised and updated descriptions, statements and sets of professional attributes, principles and areas of activity below. These are based on the evidence collected and tested throughout phase 1 and are consistent with the thematic analysis of responses presented in sections 3.10 and 4.

To be a clinical informatician first and foremost, you must be a registered and regulated health and care professional. Statement 1 is unchanged.

Statement 1.
Firstly, and fundamentally, we are describing a landscape occupied by professional clinicians who are also informaticians. So, the first criterion is that a clinical informatician must be a health or care professional registered with one of the regulators overseen by the Professional Standards Authority to be eligible for full membership or fellowship of the FCI.

We offer below, as an updated Statement 2, a short *description* of clinical informatics, rather than a formal definition. This is based on comments and feedback received throughout Phase 1 of the CCP. We recognise that this description is incomplete, but it is inclusive of health and care, is person-focused and links data and information to health and care.

Statement 2.
Clinical Informatics *is the application of data and information technology to improve patient and population health, care and wellbeing outcomes and to advance treatment and the delivery of personalised, coordinated support from health and social care.*

Statement 1 sets out that a clinical informatician is a clinician who is also active in health informatics. To reflect this and emphasise the importance of person-centred care leads us to offer a revised description of a clinical informatician as set out below in an updated Statement 3:

> **Statement 3.**
> *A **clinical informatician** uses their clinical knowledge and experience of informatics concepts, methods and tools to promote patient and population care that is person-centred, ethical, safe, effective, efficient, timely, and equitable.*

Once again, we accept that this description is incomplete, but it is inclusive of health, care and informatics with a focus on person-centred care.

Statement 4 sets out the importance of inclusivity in clinical informatics. Once again, the statement has been slightly revised to reflect feedback received. Our guiding principle has been that often "less is more" in ensuring inclusivity in terms of collaboration and cooperation.

> **Statement 4.**
> *It is essential that clinical informatics finds ways to work in collaboration and cooperation with patients, social care professionals and non-registered informaticians working in health and care.*

Statement 5 sets out the set of principles that came to mind when clinical informaticians described the boundaries that distinguish clinical informatics as a professional discipline. Statement 5 has been revised to reflect feedback received alongside an updated list of Principles.

> **Statement 5.**
> *The **Principles** set out below describe the boundaries that distinguish clinical informatics as a professional discipline. Clinical informaticians operate across the whole cycle of information processes, programmes, products and projects, bringing benefit to people and users at service, system and population levels.*

The *principles*:

a) **Purpose**: of clinical informatics is the improvement in the quality and user experience of health and social care. The areas of primary interest for clinical informatics are patient-centred care and support, data[6], technology and communication.

b) **Inclusivity:** clinical informatics encompasses and gives equal weight to health and social care. Clinical informatics is about the delivery of health, care and support services by individuals and teams, that may be multi-professional, multidisciplinary and multiservice, with the crucial involvement of patients, carers and family.

c) **Diversity**: clinical informatics is a diverse discipline and areas of focus may vary greatly (e.g. clinical safety, developing Apps and information governance). Each area of focus is equally important to achieving the overall aim of better person-centred health and social care.

d) **Interdisciplinary**: clinical informatics brings together learning from multiple disciplines including (but is not limited to); social sciences, biology, ICT, computer science, data science, psychology, linguistics, engineering, statistics, mathematics, medicine, and many others. It is important to recognise the contribution of those working at a strategic level, those influencing policy as well as those operating at operational level.

e) **Whole cycle**: clinical informatics is concerned with the whole cycle of a process, programme, product, or project. That includes inception, development, testing, roll-out, evaluation and process shut down. Those working in informatics can operate at one or more parts of the cycle.

f) **Impact**: Clinical informatics operates at service, system, and population levels and within organisational, developer, practitioner and end user culture. The benefits of clinical informatics are at the individual, service, system and population levels

Statement 6 sets out the areas that define the scope of clinical informatics practice. This has also been updated to reflect feedback on style and content.

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[6] "Data" may be too restrictive in this context, so this should be read as "data, information and knowledge".

The *areas*:

a) The interface with data[16] and information technology in health and social care, including Electronic Health and Care Record (EHCR) systems and access for the patient / service user.
b) Application of clinical informatics across the lifespan and complex context in which health and social care services operate with a focus on clinical safety and inter-operability
c) Data collection, analysis, interpretation, management and standards
d) Interventions for clinical decision support, analytics, learning systems and data visualisation to facilitate optimal health and social care delivery
e) Innovative communications with those who use health and care services to facilitate their appropriate and informed use of service provision
f) Governance frameworks and data usage policies and procedures for assurance of high-quality ethical use of health and care data, including new areas of technology and clinical practice (e.g. machine learning and genomic medicine)
g) Clinical informatics includes a leadership role supporting the clinical community to engage with, develop and make best use of informatics as a clinical asset.
h) Clinical informatics leadership and skills can be deployed at policy, strategy and operational levels within and beyond the health and care system.
i) Contribute to professional, patient and service user education and training.
j) patient and user engagement and, co-design and co-ownership.
k) Evidence and knowledge management/knowledge mobilisation & best practice

The set of professional attributes presented under Statement 7 were strongly supported in the consultation. Once again, the list of attributes has been revised to reflect comments received following the consultation responses.

The *professional attributes*:

The clinical informatician works proactively and collaboratively to:
a) **Define and prioritise** the needs of those accessing care services and clinical informatics innovations (processes, systems, policies, products and programmes)
b) **Take a leadership role** including responsibility and accountability for clinical informatics processes, change management and service transformation
c) **Lead, manage and evaluate** the opportunities and limitations of informatics innovations (processes, systems, policies, products and programmes) in improving the quality of care delivery and experience
d) **Identify and take appropriate action** against ethical, legal, data protection and security risks
e) **Ensure** that informatics innovations (processes, systems, policies, products and programmes) are appropriate for the proposed purposes, that they are safe, practical and implementable
f) Identify and address **clinical safety** issues
g) Ensure that **standards, guidance and best practice** are adhered to in clinical informatics
h) **Work constructively with** other senior information, organisational and professional leaders (e.g. SIRO, CCIO, CIO, Caldicott Guardian & Data Protection Officer) within and across organisations.

6. Conclusion

During Phase 1 of the Core Competencies Project, we explored, validated and consulted on what clinical informatics is and who we are as clinical informaticians. We have set this out in our Phase 1 Reports (A, B & C). In doing so, we believe we have met the first key challenge that was set for this project; to be able to describe who we are and what we do.

We present our findings and recommendations as a revised and updated set of statements, following a consultation exercise with our membership, the wider informatics community and key stakeholders.

These statements provide descriptions of clinical informatics and clinical informaticians accompanied by sets of professional attributes, principles and areas of activity that together describe the set of output competences of a clinical informatician.

We end with two quotes from our consultation survey, which encapsulate the key challenge for phases 2 & 3 of this project – mapping the output competences to a competency framework linked to educational and training programmes.

"From my own perspective many of these statements chime well with my understanding of clinical informatics, however I am concerned that as a set of core competencies it would be difficult for me as a founding fellow to evidence my skills against these competencies. I am also concerned that the development of training courses to cover suitable detail in clinical informatics might be challenging without some more detail behind these excellent statements on competency."

"How would one measure competency against these general statements?"

Alan Hassey,
Lydia Jidkov,
John Williams,
Trish Greenhalgh,
Mahmood Adil

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Acknowledgements

Appendix A - Methods

Responses were collated by the FCI secretariat as a weekly csv file and passed to the CCP lead author for subsequent analysis. No members of the CCP team participated in the survey. All the data was copied into an Excel spreadsheet and all entries were validated against the original csv files. When errors were found in any cell, all cells in the same row and column were rechecked. All responses to the statements tested in the Likert scales are presented as simple counts with supporting charts.

The detailed text responses were analysed by the lead author to identify commonalities and differences in the responses. The aim was to be able to gain additional insights from the detailed text responses to supplement the findings from the simple level of agreement with each of the statements provided by the Likert scale responses. Simple content analysis(9) was used to identify commonly words and phrases as a prelude to identifying themes. Where clear themes emerge from the responses, they are discussed in sections 3.10 and 4.

Appendix B - Core Competencies Project - Phase 1 consultation survey

Consultation – your responses

In our two Phase 1 reports (A & B), we present, describe and discuss a set of principles, areas and professional attributes which we test alongside definitions of clinical informatics and clinical informaticians. We suggest that together these cover the set of output competences needed to describe the landscape of clinical informatics in UK health and care, presented as a set of statements to be tested and developed further through a consultation exercise.

We are inviting key stakeholders, members of the FCI, the wider informatics community and the public to provide feedback on the CCP Phase 1 findings in this consultation exercise, which will run from 3rd December 2019 – 20th January 2020.

Q1.   Your Name:

Q2.   Your role:

Q3:   Your clinical speciality:

Q4:   Your email address:

Q5.   Are you responding on behalf of an organisation?   Y/N

Q6.   If "Yes" – which organisation?

Statement 1
Firstly, and fundamentally, we are describing a landscape occupied by professional clinicians who are also informaticians. So, the first criterion is that a clinical informatician must be a health or care professional registered with one of the regulators overseen by the Professional Standards Authority to be eligible for full membership or fellowship of the FCI.

Q7. Please indicate in the box below, with an **"x"** the degree to which you agree or disagree with statement 1.

Q7

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

Q8. Please add any comments in the text box below.

Given the vast scope and range of activities covered by clinical informatics, there is a great deal of sense in keeping any definition of clinical informatics short, inclusive and consistent with the wider international community.

Statement 2

> **Clinical Informatics** *involves embracing the benefits of digital technology with respect to health and wellbeing to advance treatment and the delivery of personalised, coordinated support from health and social care.*

Q9. Please indicate in the box below, with an **"x"** the degree to which you agree or disagree with statement 2.

Q9.

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

Q10. Please add any comments in the text box below.

The FCI's definition of a clinical informatician (below) has come through Phase 1 largely unchallenged and seems consistent with the new definition of clinical informatics introduced above, and with the FCI's aims and objectives. Importantly, this modified definition is also consistent with the NHS quality domains of; patient safety, clinical effectiveness and the experience of patients.

> **Statement 3**
> **A clinical informatician** *uses unique knowledge and experience of informatics concepts, methods and tools to promote care that is safe, effective, efficient, timely, person centred and equitable.*

Q11. Please indicate in the box below, with an **"x"** the degree to which you agree or disagree with statement 3.

Q11.

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

Q12. Please add any comments in the text box below.

However, we are wary of definitions, which by their nature are inclusive of some professionals and skills yet exclusive of others. We are not convinced that the various definitions of clinical informatics and clinical informatician fully describe all of what we do and who we are. In our reports, we have discussed how "less is more" in terms of being inclusive, given the vast scope and range of activities covered by clinical informatics, so there is a great deal of sense in keeping the definitions short, inclusive and consistent with the wider international community.

> **Statement 4**

> *It seems essential to us that clinical informatics is fully inclusive of the range of professionals and skills needed to meet the challenges of supporting health and well-being in the twenty-first century.*

Q13. Please indicate in the box below, with an **"x"** the degree to which you agree or disagree with statement 4.

Q13.

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

Q14. Please add any comments in the text box below.

> ***Statement 5***
> *The set of **Principles** presented and tested in Phase 1 of the CCP study seem to be generally well supported by respondents. Clinical informaticians operate across the whole cycle of information processes, programmes, products and projects, bringing benefit to people and users at service, system and population levels.*

These ***principles*** are described below:

g) **Purpose**: of clinical informatics is the improvement in the quality and experience of health and social care, and the areas of primary concern for clinical informatics are data[7], technology and communication.

h) **Inclusivity:** clinical informatics encompasses and gives equal weight to health and social care. It was felt that clinical informatics has been predominantly focussed on hospital and GP care, and been led by GPs and physicians. There was concern that the discourse continues to be health and physician/GP biased exacerbating the assumption that informatics is about healthcare and failing to recognise the involvement of teams, multidisciplinary and multiservice, as well as the involvement of patients, carers and family.

i) **Diversity**: clinical informatics is a diverse discipline and areas of focus vary greatly, e.g. developing Apps, guidance on information governance. Each area of focus is equally important to achieving the overall aim of better person-centred health and social care. One respondent reminded us not forget the human implications of diversity either.

j) **Interdisciplinary**: clinical informatics brings together learning from multiple disciplines. Disciplines involved in clinical informatics include social sciences, biology, ICT, computer science, data science, psychology, linguistics, engineering, statistics, mathematics, medicine, and many others.

k) **Whole cycle**: clinical informatics is concerned with the whole cycle of a process, programme, product, project, that is from inception to identifying improvements from evaluation and process shut down. Those working in informatics can operate at one or more parts of the cycle.

l) **Unit of operation**: Clinical informatics operates at service, system, and population levels and within organisational, developer, practitioner and end user culture. The benefits of clinical informatics are at the individual, service, system and population levels

Q15. Please indicate in the box below, with an **"x"** the degree to which you agree or disagree with statement 5.

Q15.

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[7] "Data" may be too restrictive in this context, so this should be read as "data, information and knowledge".

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

Q16. Please add any comments in the text box below.

Statement 6
*The set of **Areas** that describe the scope of clinical informatics are also well-supported, alongside the additional areas suggested by respondents including; inter-operability, clinical safety, leadership and clinical engagement. There was a clear recognition that 'big data", population medicine and data analytics skills are valuable clinical informatics tools, key to improving health outcomes.*

The scope of Clinical informatics includes the following *areas*:

l) How people interface with ICT in health and social care, including electronic health and care record (EHCR) systems and person care portals

m) Methods to collect, manage, provide security for, and analyse clinical data and "big data"

n) Application of informatics across the lifespan in the multi-layered and complex context in which health and social care services operate

o) Interventions for clinical decision support, safety alerts, and data visualisation to facilitate optimal health and social care delivery

p) Innovative communications with those receiving care to facilitate their appropriate and informed use of health and social care provision

q) Ethical and information governance frameworks and data usage policies and procedures for assurance of high-quality ethical use of individuals' data.

Q17. Please indicate in the box below, with an **"x"** the degree to which you agree or disagree with statement 6.

Q17.

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

Q18. Please add any comments in the text box below.

Statement 7
*The set of **Professional attributes** were strongly supported by respondents and seem to be key components of clinical informatics practice.*

These professional attributes need to be specific enough to be meaningful and useful for developing the core competencies and a competency framework

Professional attributes:

The clinical informatician works proactively (often in a leadership role), and collaboratively to:

    i)   **Define and prioritise** the needs of those receiving care and clinicians in informatics innovations (processes, systems, policies, products and programmes)

    j)   **Evaluate** the opportunities and limitations of informatics innovations (processes, systems, policies, products and programmes) in improving the quality of care delivery and experience

    k)   **Identify and take appropriate action** against ethical, legal, data protection and security risks

    l)   **Ensure** that informatics innovations (processes, systems, policies, products and programmes) are appropriate for the proposed purposes, that they are practical and implementable

    m)   Identify and address **clinical safety** issues

    n)   Ensure that **standards, guidance and best practice** are adhered to in clinical informatics

Q19. Please indicate in the box below, with an **"x"** the degree to which you agree or disagree with statement 7.

Q19.

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

Q20. Please add any comments in the text box below.

Q21. Is there anything else you would like to add?

Thank you – Dr Alan Hassey (CCP Project Director)