Protocol

Development of core competencies for Clinical Informatics in the UK

Sponsor	Faculty of Clinical Informatics
Funder	Faculty of Clinical Informatics
Funding Reference Number	N/A
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Version Number and Date	Version: 2.2, date: 15/08/2019
DOI	10.5281/zenodo.3956373

Contents

List of abbreviations

AMIA	American Medical Informatics Association
BDRW	Building a Digital Ready Workforce
CI	Clinical Informatics
DMP	Data Management Plan
EBM	Evidence Based Medicine
HDR UK	Health Data Research UK
HEE	Health Education England
HI	Health Informatics
ICF	Informed Consent Form
ICL	Imperial College London
IMIA	International Medical Informatics Association
NHSDA	NHS Digital Academy
NLP	Natural Language Processing
PERT	Program Evaluation Review Technique
PHE	Public Health England
PIS	Participant Information Sheet
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SCIE	Social Care Institute for Excellence
UoM	The University of Manchester
UREC	University Research Ethics Committee

Summary

This protocol is based on the detailed proposal authored by Hassey and Jidkov, (2019)[1] and represents the subset of work that the University of Manchester would participate in carrying out. This links to the wider national UK strategy to develop health data science skills that HDRUK (linked through the proposer) also support across key partner organisations such as the Faculty of Clinical Informatics (FCI). The purpose of the work is to generate a framework of core competencies for clinical informaticians operating in the UK. The proposed primary stages include 1) carrying out a systematic literature review to identify competencies, 2) refining the framework with expert consultation in the form of semi-structured interviews and 3) evaluating the final framework via a wider survey.

Background

The Building a Digital Ready Workforce (BDRW) programme that delivers the NHS Digital Academy (NHSDA) requires independent accreditation to be provided by the FCI. In order to provide relevant and high quality accreditation for Clinical Informaticians (CIs), the FCI must first undertake a review of the core knowledge and skills required. The review will be used to construct a competency framework that will be subsequently mapped to educational and training courses to align them with the required core competencies. In order to do this the current skills, knowledge, curricula and job descriptions need to be identified and synthesised by exploring the available literature sources. Following from this, expert consensus (via interviews) will be used to shape and refine these competencies ensuring that they are relevant to CI in the UK and that they represent 'core' (fundamental) competencies for professional Clinical Informaticians. Finally competencies will be further evaluated by wider consultation using a survey to elicit additional expert evaluation.

This work builds on the initial work carried out by Quinn, Hassey and Jidkov, (2019)[2] that reports on findings from interviews with clinicians working in the informatics domain (n=16). The report discusses the definitions of clinical informatics and the professional attributes of a Clinical Informatician. The report determined that participants desired a single overarching competency framework for Clinical Informaticians.

[1] Faculty of Clinical Informatics: Proposal for the Development of Core Competencies for Clinical Informaticians in the United Kingdom V1.11 Competencies Project Proposal
[2] Faculty of Clinical Informatics: Development of Core Competencies for Clinical Informatics in the United Kingdom V0.06

Objectives

The work has five main objectives:

1. Carry out a systematic literature review to identify the core CI competencies and curricular design [***Stage I(a)***]
2. Carry out parallel job listing analysis (using NLP methods) of online sources to capture core CI competencies that may not be identified in objective 1 [***Stage I(b)***]
3. Use synthesised findings to create a competency framework [***Stage I(c)***]
4. Evaluate the framework via expert consultation in the form of semi-structured interviews [***Stage II***]
5. Refine framework and seek wider evaluation via survey [***Stage III***]

An overview of the project can be seen in Figure 1.

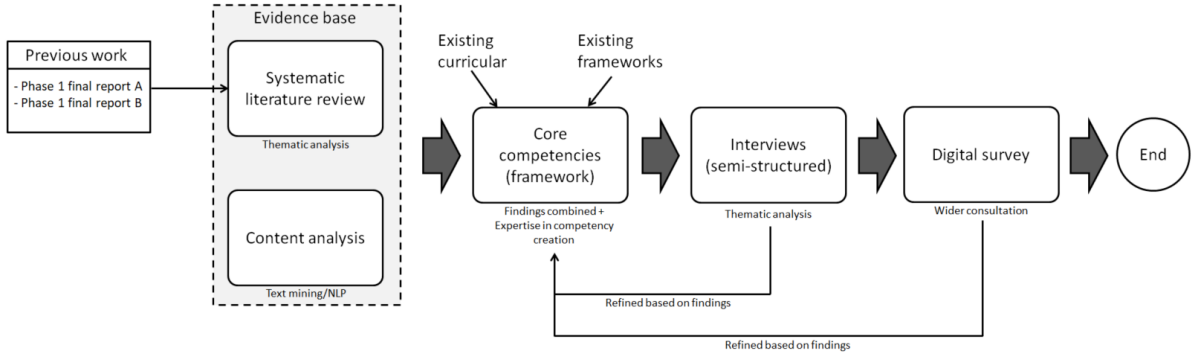

Figure 1: Overview of proposed project

Design

The project will have three main stages. The first stage will consist of a systematic literature review, job listings analysis using NLP methods and subsequent Thematic Analysis (TA) (Braun & Clarke, 2008) of themes surrounding the competencies and skillset of clinical informaticians along with descriptions of related jobs, courses and related curricular.

Stage I (a) (Objective 1)

Carry out a systematic review using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to present findings. This will provide a foundation for the parallel work described in Stage I (b). The search will be run once. This will highlight key literature that has a focussed curriculum related to the key disciplines and domains shown in Table 1.

Concept
Health (care) informatics
Clinical informatics
Medical informatics
Nursing informatics
Pharmacy informatics
Dental informatics
Citizen-driven informatics
Social (care) informatics
Personal health informatics
Consumer driven informatics
Health data science
Public health informatics
Clinical bioinformatics

Table 1: List of informatics domain/specialist concepts

Systematic reviews are still considered to be at the pinnacle of most evidence hierarchies regarding the quality and credibility of evidence (Davies, 2019). When formal reporting processes are used, such reviews can be replicated and the sources included are transparent. The incorporation of Grey literature (unpublished work, student theses etc.) can also address the issue of publication bias. Qualitative techniques, such as Thematic Analysis or framework analysis can be used to synthesise and report finding from a systematic review, combining a rigorous and systematic process with the depth of analysis that qualitative methods provide.

The search criteria were modified from V1.11 of the Competencies Project Proposal to include the concepts in Table 1 and the following:

(((Table 1 concepts) AND (standard OR standards OR competenc* OR skill* OR knowledge OR curricul* OR syllab*)))

We plan to screen the titles and abstracts for relevant articles using two reviewers. Consensus will then be achieved through discussion between the two reviewers. The two reviewers will then independently undertake full text screening on the remaining items. The primary competency themes will then be extracted and themes and sub-themes identified

using thematic analysis (TA). One reviewer will perform data extraction while the second will check entries for accuracy. Thematic analysis will be performed jointly by the two reviewers with any discrepancies discussed until consensus is reached.

Stage I (b) (Objective 2)

This parallel stage focusses on knowledge and skills organisations (see (Meyer, 2019) for example). This will expand the search terms and capture organisations, skills and knowledge that would otherwise not be captured in stage I (a). This is an iterative semi-automated approach that will facilitate the development of the competency framework and skills required. This will utilise text mining/NLP techniques to identify keywords to capture this aspect of the requirements. To achieve this data will be scraped from specific online sources of relevance (Table 2), as well as adding keywords from known sources [i.e.(Meyer, 2019)]. Data scraping (a.k.a. web-scraping) is an automated method of extracting data from websites and exporting it in a form useful for subsequent analysis. This enables us to collate and combine unstructured data from multiple sources into a structured form, allowing summative content analysis to be subsequently performed. This method can be expanded from simple metrics like word frequency by including latent content analysis to provide interpretation and context (Hsieh & Shannon, 2005). This approach can also be applied iteratively.

Organisation & related frameworks
AMIA
Canada Informatics
IMIA
NHS England
HEE
The Health Foundation (analytical)
Biomedical Research Centres
NHS Digital Academy
Apprenticeship providers

Table 2: Example organisations/sources for keyword extraction (non-exhaustive)

In addition we will include any other curriculum and frameworks that we have access to, for example, the NHS Digital Academy curriculum. Findings from the review will be used to identify competencies that will be used to construct a framework.

Stage I (c) (Objective 3)

Using the information acquired and synthesised from the review, web-scraping and other sources (direct access to curricular) a competency framework will be generated.

Stage II (Objective 4)

The second stage is to carry out semi-structured interviews to agree the competencies derived from the review and ensure that they are in scope. This will also provide an opportunity to identify any "missing" competencies. The interviews will be audio recorded and subsequently transcribed. The resulting transcriptions will be analysed using TA and a second coder will match a sub-sample of quotes (~33%) with codes to test for coding agreement and increase robustness. Interviews will be carried out in person or via Skype/Zoom/phone. Participants will be provided with a PIS and informed consent recorded on a consent form prior to taking part. The questions would be used as a starting point for further discussion. We would aim to carry out a small pilot of the interview to check the suitability of the proposed interview schedule.

Study population (stage II)

The participants will be selected from the FCI using convenience and snowball sampling until saturation is reached (no more new themes are emerging). Experts will have a wide and representative set of backgrounds and will be either FCI fellows or compared against the fellowship criteria to ensure they meet the requirements to take part in the study. Snowball sampling will be used to elicit other potential participants that are identified by current participants.

Stage III (Objective 5)

A digital tool will be developed to distribute a survey, where respondents will view and validate the competency framework providing ratings (5 point Likert items) and open-ended questions for the frameworks relevance to the UK, and to ensure it contains only core competencies. Free text will also allow for additional comments to be made. Informed consent will be sought electronically. Participants will be unable to proceed to validate the framework if consent is not obtained (via selecting a tick box).

Study population (Stage III)

Participants will be recruited via mail listings, existing networks and by targeting suitable clinical informatics organisations. The survey tool will collect background and diversity demographic data from participants. The aim is to capture the views and opinions of the wider clinical informatics community pertaining to the validation of the proposed framework that has been modified in line with results of the interviews.

Ethics/data processing

Ethical approval will be sought from the University of Manchester's proportional review ethics committee (UREC). Ethical approval will be sought for the interviews and survey evaluation. Obtaining ethical approval is a requirement for subsequent publication of findings. In keeping with the University's ethics application requirements, data management plans will be generated for the project. Data collected, stored and processed during the course of this work will comply with the University's policies on research and data processing. All data storage and processing will be carried out in compliance with the UKs Data Protection Act [2018] and the EUs General Data Protection Regulations (GDPR)[2016].

Resources required

This work would be carried out on a consultancy basis with the University of Manchester. The accreditation phase of the work is not detailed in this protocol.

Personnel resources

Name	Role	Project role
Prof. Georgina Moulton	Professor of Bio-Health Informatics and Education, Director of Learning and Development, HDR UK and Manchester Biomedical Research Centre Capacity Building Lead. https://www.research.manchester.ac.uk/portal/en/researchers/george-moulton(862e93ac-74bd-4d78-b819-981c69e2698f).html	Oversight, development and writing of competency framework.
Dr. Alan Davies	Lecturer in Health Data Science. Former Data Science fellow AstraZeneca. Former cardiac nurse. https://www.research.manchester.ac.uk/portal/alan.davies-2.html	Primary reviewer, interviewer and analyst.
Dr. Julia Mueller	Lecturer in Healthcare Sciences. https://www.research.manchester.ac.uk/portal/julia.mueller.html	Second coder/reviewer.

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