



# TIGER International Competency Synthesis Project

## *Global Health Informatics Competency Recommendation Frameworks*

April 2020



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## Global Health Informatics Competency Recommendation Frameworks

The TIGER International Task Force began comprehensive activities to compile recommended core international informatics competencies reflective of many countries, scientific societies, and research projects. The project involved three phases:

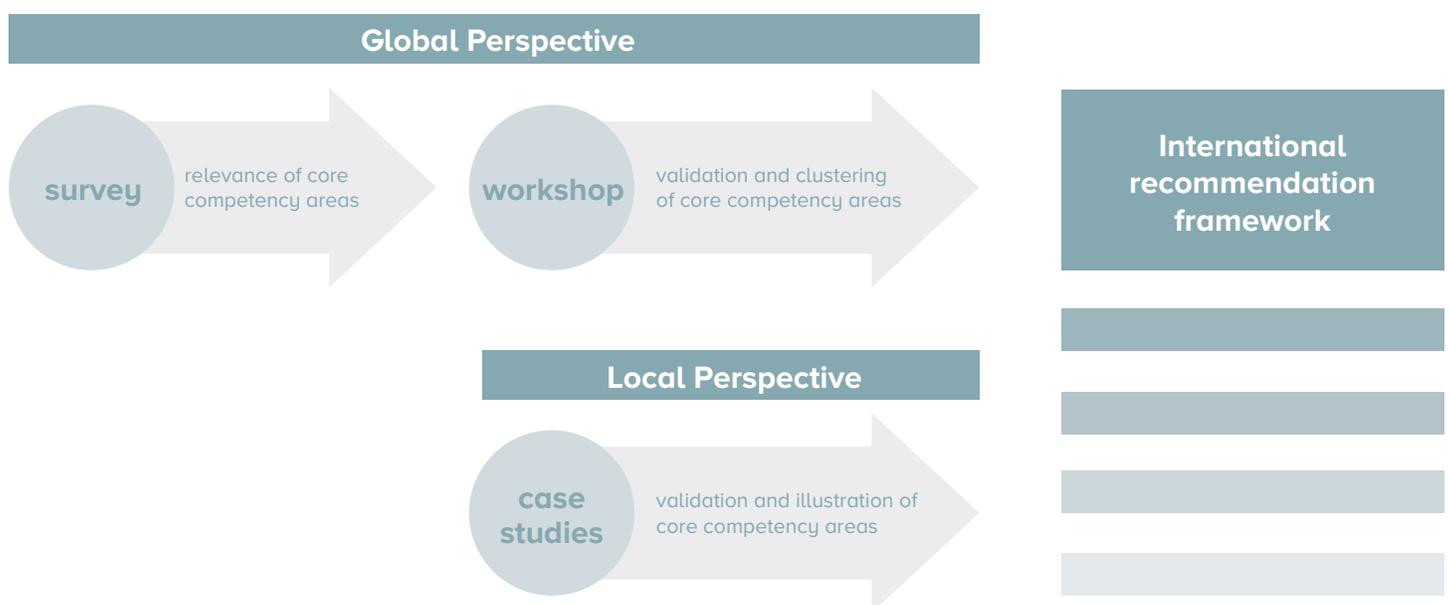
1. Compilation of national case studies submitted by our global Committee members from Australia, Brazil, China/Taiwan, Finland, Germany (inclusive of Austria and Switzerland), Ireland, New Zealand, the Philippines, Portugal, Scotland and the United States.
2. Deployment of a survey composed of 24 areas of core competencies in clinical informatics within five domains: 1) clinical nursing 2) nursing management 3) quality management 4) IT management in nursing 5) coordination of interprofessional care. The questionnaire was sent to 21 countries yielding participation from 43 experts to truly capture a global perspective.
3. Creation of the *Recommendation Framework 1.0* (nursing centric) derived from case studies, survey results, and stakeholder input. This framework was populated with international recommendations for cognitive competencies in nursing, aimed at providing a grid to host knowledge about informatics competencies, professional roles, priorities and practical experience.

Subsequently, the TIGER International Competency Synthesis Project (ICSP) and the EU\*US eHealth Work Project joined forces to describe and validate the TIGER Initiative's framework of global health informatics core competencies focused on a broad range of health professionals and their interprofessional collaboration with expert survey input from 51 countries and 22 global case studies. Together, the findings populated *Recommendation Framework 2.0* to help measure, inform, educate and advance the development of a skilled workforce throughout the EU, US and around the world.

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### Recommendation Framework 1.0 – nursing focus

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**Table 1.** Top 10 core competency areas in the five roles and related mean relevance (REL) (0...100).

**Clinical Nursing**  
(Direct Patient Care)

	<b>Core competency area</b>	<b>REL ± SD</b> n=41
<b>1</b>	Nursing documentation (including terminologies)	94.4 ± 16.7
<b>2</b>	Information and knowledge management	82.2 ± 23.5
<b>3</b>	Principles of nursing informatics	80.5 ± 23.1
<b>4</b>	Data protection and security	80.0 ± 23.2
<b>5</b>	Ethics and IT	79.5 ± 21.6
<b>6</b>	Information and communication systems	75.1 ± 24.4
<b>7</b>	Quality management	72.0 ± 22.3
<b>8</b>	Decision support by IT	70.2 ± 28.5
<b>9</b>	eHealth, telematics and telehealth (including interoperability)	69.5 ± 25.0
<b>10</b>	Assistive technology for ageing people	69.0 ± 25.5

**Quality Management**

	<b>Core competency area</b>	<b>REL ± SD</b> n=41
<b>1</b>	Quality management	96.1 ± 13.2
<b>2</b>	Process management	86.8 ± 17.4
<b>3</b>	Nursing documentation (including terminologies)	84.4 ± 22.5
<b>4</b>	Information and knowledge management	83.2 ± 20.3
<b>5</b>	Information and communication systems (including interoperability)	80.2 ± 22.0
<b>6</b>	Principles of nursing informatics	80.2 ± 22.0
<b>7</b>	Data protection and security	79.5 ± 23.3
<b>8</b>	Project management	78.5 ± 21.0
<b>9</b>	Principles of management	78.5 ± 20.8
<b>10</b>	Change management and stakeholder management	77.6 ± 25.5

**Coordination of inter-professional care**

	<b>Core competency area</b>	<b>REL ± SD</b> n=41
<b>1</b>	Data protection and security	85.9 ± 20.2
<b>2</b>	Information and knowledge management	85.4 ± 20.1
<b>3</b>	Nursing documentation (including terminologies)	83.4 ± 21.4
<b>4</b>	Process management	83.2 ± 20.8
<b>5</b>	Information and communication systems (including interoperability)	81.5 ± 23.0
<b>6</b>	Ethics and IT	78.8 ± 23.7
<b>7</b>	eHealth, telematics and telehealth (including interoperability)	77.6 ± 22.8
<b>8</b>	Quality management	77.1 ± 22.6
<b>9</b>	Principles of nursing informatics	74.6 ± 23.4
<b>10</b>	Principles of management	74.6 ± 23.5

Continuation of Table 1.

Nursing Management

	Core competency area	REL ± SD n=43
1	Nursing documentation (including terminologies)	92.1 ± 13.9
2	Principles of management	87.9 ± 18.6
3	Strategic management and leadership	86.7 ± 19.9
4	Quality management	85.1 ± 20.3
5	Human resource management	84.4 ± 18.8
6	Change management and stakeholder management	84.2 ± 19.8
7	Information and knowledge management	84.0 ± 22.1
8	Principles of nursing informatics	82.3 ± 20.1
9	Process management	81.2 ± 20.4
10	Ethics and IT	80.5 ± 26.0

IT Management in Nursing

	Core competency area	REL ± SD n=41
1	Information and communication systems (including interoperability)	89.5 ± 15.3
2	Principles of nursing informatics	89.5 ± 19.2
3	Data protection and security	89.0 ± 17.3
4	IT risk management	86.8 ± 19.3
5	Project management	86.8 ± 17.8
6	Process management	86.1 ± 16.2
7	Information and knowledge management	86.1 ± 22.7
8	Decision support by IT	85.4 ± 19.8
9	Applied computer science/informatics	83.4 ± 19.7
10	Nursing documentation (including terminologies)	83.4 ± 22.2

**Table 2.** Four domains of core competency areas workshop attendees rated as highly relevant and corresponding items and competencies mentioned by the workshop attendees

Data, information and knowledge (DIK) domain	Associated core competency areas (main similarities)
1) know how to use data/information not only how to enter data	Principles of nursing informatics Information management and knowledge management in patient care Decision support by IT
2) perform care planning and use of data	Nursing documentation (including terminologies) Resource planning and logistics Decision support by IT
3) make use of indicators (information) for decision making	Information management and knowledge management in patient care Decision support by IT
4) analyze what data are needed and are useful, link to data/information science	Principles of nursing informatics Information management in research Information management and knowledge management in patient care Information management in teaching, training and education

**Continuation of Table 2.**

Data, information and knowledge (DIK) domain	Associated core competency areas (main similarities)
5) nurses as knowledge workers: access and use evidence based & structured information	Information management and knowledge management in patient care
6) use data for research and development	Information management in research
7) information governance	Information management in research Information management and knowledge management in patient care Information management in teaching, training and education
<b>Information exchange and information sharing (IEIS) domain</b>	
1) continuity of care	Information and communication systems eHealth, telematics and telehealth
2) sharing of information with the patient, work in partnership, learn to listen	eHealth, telematics and telehealth Assistive technology for ageing people
3) provide information map of caring for the citizens	Assistive technology for ageing people
4) health information exchange	Information and communication systems eHealth, telematics and telehealth
5) interoperability	Information and communication systems
<b>Ethics and legal issues (EL) domain</b>	
1) ethics	Ethics and IT
2) security and privacy	Data protection and security
3) use of social media and ethical use of data	Ethics and IT, data protection and security
<b>Systems life cycle management (SLCM) domain</b>	
1) address requirements	Applied computer science/informatics
2) communicate with engineers	Project management
3) design thinking	Information and communication systems Applied computer science/informatics Project management IT risk management
4) process design	Process management

**Table 3.** Cronbach's alpha for the six final domains in each professional role with the related core competency areas within the domains

Domains	Clinical nursing (n=41)	Quality management (n=41)	Coordination of inter-professional care (n=41)	Nursing management (n=43)	IT management in nursing (n=41)
<b>Data, information and knowledge (DIK)</b>	0.87	0.89	0.90	0.88	0.87
Principles of nursing informatics					
Information management and knowledge management in patient care					
Nursing documentation ( <i>including terminologies</i> )					
Decision support by IT					
Information management in research					
Information management in teaching, training and education					
Resource planning and logistics					
<b>Information exchange and information sharing (IEIS)</b>	0.78	0.79	0.76	0.87	0.76
eHealth, telematics and telehealth					
Assistive technology for ageing people					
Information and communication systems					
<b>Ethics and legal issues (EL)</b>	0.87	0.85	0.84	0.67	0.76
Data protection and security					
Ethics and IT					
<b>Systems life cycle management (SLCM)</b>	0.84	0.78	0.91	0.84	0.91
Information and communication systems					
Applied computer science/informatics					
Process management					
Project management					
IT risk management					
<b>Management in informatics (MAN)</b>	0.94	0.87	0.96	0.90	0.93
Principles of management					
Strategic management and leadership					
Quality management					
Change management and stakeholder management					
Financial management					
Human resource management					
<b>Biostatistics and medical technology (STAT&amp;TECH)</b>	0.77	0.81	0.77	0.90	0.87
Assistive technology for ageing people					
Biomedical imaging and signal processing					
Biostatistics/statistics					

**Table 4.** Recommendation framework of health informatics for nurses. Legend: DIK = data, information, knowledge; IEIS = information exchange and information sharing; SLCM = system life cycle management; MAN = management in informatics; STAT&TECH = biostatistics and medical technology; REL = mean relevance from 0 ... 100.

Roles		Clinical nursing (direct patient care)		Quality management		Coordination of inter-professional care	
Core competency area	domains	REL n=41		REL n=41		REL n=41	
Principles of nursing informatics	DIK	80.5		80.2		74.6	
Information management and knowledge management in patient care	DIK	82.2		83.2		85.4	
Nursing documentation (including terminologies)	DIK	80.5		84.4		83.4	
Decision support by IT	DIK	70.2		72.7		70.0	
Information management in research	DIK	51.0		72.4		60.5	
Information management in teaching, training and education	DIK	61.7		67.1		66.1	
Resource planning and logistics	DIK	56.6		65.4		71.7	
Data protection and security	EL	80.0		79.5		85.9	
Ethics and IT	EL	79.5		75.9		78.8	
eHealth, telematics and telehealth	IEIS	69.5		69.8		77.6	
Assistive technology for ageing people	IEIS / STAT & TECH	69.0		54.9		70.2	
Information and communication systems	IEIS / SLCM	75.1		82.0		81.5	
Applied computer science/informatics	SLCM	53.7		63.7		64.9	
Process management	SLCM	67.8		86.8		83.2	
Project management	SLCM	55.6		78.5		72.4	
IT risk management	SLCM	61.2		73.9		67.8	
Principles of management	MAN	59.8		78.5		74.6	
Strategic management and leadership	MAN	57.1		77.1		72.7	

Continuation of Table 4.

Roles		Clinical nursing (direct patient care)		Quality management		Coordination of inter-professional care	
Core competency area	domains	REL n=41		REL n=41		REL n=41	
Quality management	MAN	72.0		96.1		77.1	
Change management and stakeholder management	MAN	58.0		77.6		73.7	
Financial management	MAN	47.6		65.4		62.0	
Human resource management	MAN	57.1		68.8		68.0	
Biomedical imaging and signal processing	STAT & TECH	55.6		49.5		55.4	
Biostatistics/statistics	STAT & TECH	47.8		76.6		55.6	
Principles of nursing informatics	DIK	82.3		89.5			
Information management and knowledge management in patient care	DIK	84.0		86.1			
Nursing documentation (including terminologies)	DIK	92.1		83.4			
Decision support by IT	DIK	74.7		85.4			
Information management in research	DIK	63.3		71.5			
Information management in teaching, training and education	DIK	70.0		74.4			
Resource planning and logistics	DIK	76.0		71.7			
Data protection and security	EL	80.2		89.0			
Ethics and IT	EL	80.5		83.4			
eHealth, telematics and telehealth	IEIS	66.3		80.0			
Assistive technology for ageing people	IEIS	66.3		70.2			
Information and communication systems	IEIS / STAT & TECH	75.1		89.5			
Applied computer science/ informatics	SLCM	57.4		83.4			



**Continuation of Table 4.**

<b>Roles</b>		<b>Nursing management</b>		<b>IT management in nursing</b>	
<b>Core competency area</b>	<b>domains</b>	<b>REL n=43</b>		<b>REL n=41</b>	
Process management	SLCM	81		86.1	
Project management	SLCM	76.3		86.8	
IT risk management	SLCM	73.3		86.8	
Principles of management	MAN	87.9		79.3	
Strategic management and leadership	MAN	86.7	 	79.5	
Quality management	MAN	85.1	 	80.7	
Change management and stakeholder management	MAN	84.2	 	80.5	
Human resource management	MAN	84.4		69.8	
Biomedical imaging and signal processing	STAT & TECH	54.7		62.4	
Biostatistics/statistics	STAT & TECH	59.5		67.3	

**Conclusion:**

This international recommendation framework for core competency areas in health informatics for nurses aims at providing a grid to embrace knowledge about competencies, professional roles, priorities and practical experience. The framework refers to the term health informatics in nursing to demonstrate its rooting in nursing informatics and its openness towards other healthcare professionals and their interaction with nurses. We contend that learning and teaching on the individual level are active processes of constructing the educational space. Therefore, our recommendations should work as a framework that guides and stimulates learners and teachers alike. It should leave enough room for individual creativity, aspiration for innovation and personal fulfillment. Due to technology being a moving target, this recommendation framework should be revised and updated regularly. We propose a five-year period of validity.

**Resources:**

**Methods Inf Med 2018; 57(Open 1): e30-e42**

**TIGER International Competency Synthesis Project**

## Recommendation Framework 2.0 – interdisciplinary focus

In fall 2019, *Recommendation Framework 2.0* was released with expert input from 51 countries. Findings from the [EU\\*US eHealth Work Project's](#) scope of work, funded by the European Commission's [Horizon 2020](#) research and innovation grant program, were executed to empirically describe and validate the TIGER framework of health informatics competencies for a broad range of health professionals and their interprofessional collaboration.

**Table 1. Core competency areas in alphabetical order**

<i>Applied computer science</i>	<i>Interoperability and integration</i>
<i>Assistive technology</i>	<i>IT risk management</i>
<i>Change/stakeholder management</i>	<i>Leadership</i>
<i>Clinical decision support by IT</i>	<i>Learning techniques</i>
<i>Communication</i>	<i>Legal issues in health IT</i>
<i>Consumer health informatics</i>	<i>Medical technology</i>
<i>Data analytics</i>	<i>Principles of health informatics</i>
<i>Data protection and security</i>	<i>Principles of management</i>
<i>Documentation</i>	<i>Process management</i>
<i>e/mHealth, telematics, telehealth</i>	<i>Project management</i>
<i>Ethics in health IT</i>	<i>Public health informatics</i>
<i>Financial management</i>	<i>Quality and safety management</i>
<i>Care processes and IT integration</i>	<i>Resource planning &amp; management</i>
<i>ICT / systems (applications)</i>	<i>Strategic management</i>
<i>ICT / systems (architectures)</i>	<i>System lifecycle management</i>
<i>Information management research</i>	<i>Teaching, training, education</i>
<i>Information and knowledge management in patient care</i>	

**Table 2.** Top 10 core competency areas in the six roles and related mean relevance (REL - 0...100)

<b>Direct patient care (DPC) (nurses/physicians/therapists)</b>		
	<b>Core competencies</b>	<b>REL ± SD</b>
1	<i>Communication [n=335]</i>	92.4 ± 14.5
2	<i>Documentation [n=337]</i>	91.7 ± 17.2
3	<i>Information &amp; knowledge management in patient care [n=335]</i>	89.9 ± 17.5
4	<i>Quality &amp; safety management [n=333]</i>	87.5 ± 18.9
5	<i>Leadership [n=336]</i>	86.2 ± 19.0
6	<i>Learning techniques [n=334]</i>	85.6 ± 18.8
7	<i>Teaching, training &amp; education in healthcare [n=333]</i>	84.4 ± 21.0
8	<i>Ethics in health IT [n=334]</i>	83.8 ± 22.9
9	<i>Information &amp; communication technology (applications) [n=332]</i>	81.6 ± 20.5
10	<i>Care processes &amp; IT integration [n=333]</i>	81.1 ± 21.3

Continuation of Table 2.

Health information management (HIM)		
	Core competencies	REL ± SD
1	Communication [n=184]	90.1 ± 19.0
2	Documentation [n=184]	87.7 ± 18.0
3	Data analytics [n=183]	87.7 ± 17.9
4	Leadership [n=184]	87.0 ± 19.0
5	Data protection & security [n=184]	86.9 ± 19.3
6	Information & knowledge management in patient care [n=182]	86.2 ± 19.4
7	Ethics in health IT [n=184]	85.6 ± 20.2
8	Principles of health informatics [n=182]	85.1 ± 18.4
9	Care processes & IT integration [n=183]	84.8 ± 19.1
10	Learning techniques [n=184]	84.2 ± 20.2
Executives (EXC) (clinical and administrative)		
	Core competencies	REL ± SD
1	Leadership [n=55]	96.4 ± 7.8
2	Communication [n=55]	95.8 ± 8.3
3	Quality & safety management [n=55]	90.4 ± 16.1
4	Information & knowledge management in patient care [n=55]	89.2 ± 16.9
5	Strategic management [n=55]	89.1 ± 21.0
6	Principles of management [n=55]	88.5 ± 19.9
7	Legal issues in health IT [n=55]	87.5 ± 16.3
8	Process management [n=55]	87.5 ± 16.4
9	Resource planning & management [n=55]	87.3 ± 21.7
10	Ethics in health IT [n=55]	87.0 ± 18.3
Chief information officers (CIO) (clinical and technical)		
	Core competencies	REL ± SD
1	Leadership [n=62]	93.8 ± 9.6
2	Communication [n=62]	93.1 ± 10.6
3	Care processes & IT integration [n=62]	91.8 ± 13.7
4	Principles of management [n=61]	90.8 ± 12.2

**Continuation of Table 2.**

5	Quality & safety management [n=61]	90.5 ± 12.7
6	Strategic management [n=61]	90.0 ± 13.4
7	Process management [n=62]	89.6 ± 13.6
8	Change & stakeholder management [n=61]	89.6 ± 12.6
9	Ethics in health IT [n=61]	88.7 ± 18.0
10	Resource planning & management [n=61]	88.4 ± 18.7
<b>Engineering or health IT specialist (ENG)</b>		
	<b>Core competencies</b>	<b>REL ± SD</b>
1	<i>Communication [n=172]</i>	91.3 ± 14.2
2	<i>Care processes &amp; IT integration [n=171]</i>	87.5 ± 18.9
3	<i>Information &amp; communication technology (applications) [n=171]</i>	87.2 ± 18.0
4	Leadership [n=172]	86.1 ± 17.8
5	Project management [n=172]	85.4 ± 19.7
6	Data protection & security [n=171]	84.3 ± 22.6
7	Ethics in health IT [n=170]	83.4 ± 22.2
8	Interoperability & integration [n=172]	83.0 ± 21.7
9	Documentation [n=172]	82.1 ± 22.6
10	Process management [n=172]	82.0 ± 21.7
<b>Science and education (S&amp;E)</b>		
	<b>Core competencies</b>	<b>REL ± SD</b>
1	Communication [n=218]	91.6 ± 16.1
2	Teaching, training & education in health care [n=220]	89.2 ± 17.8
3	Leadership [n=218]	88.2 ± 17.3
4	Learning techniques [n=218]	88.1 ± 18.8
5	Ethics in health IT [n=219]	86.5 ± 21.3
6	Documentation [n=222]	86.3 ± 21.2
7	Information & knowledge management in patient care [n=221]	86.3 ± 20.2
8	Principles of health informatics [n=218]	83.3 ± 23.2
9	Quality & safety management [n=220]	83.1 ± 22.9
10	Data analytics [n=218]	81.9 ± 23.6

**Table 3.** Cronbach's Alpha values for the roles and clusters (no. core competency areas)

Clusters	Roles					
	DPC	ENG	HIM	EXC	CIO	S&E
DIK (8)	0.86	0.88	0.90	0.86	0.82	0.92
n	322	161	174	54	51	211
IEIS (8)	0.88	0.88	0.91	0.91	0.88	0.92
n	321	160	171	54	59	207
EL (3)	0.82	0.87	0.90	0.79	0.87	0.89
n	330	169	182	55	51	217
SYS (4)	0.85	0.85	0.88	0.90	0.85	0.91
n	324	167	176	54	51	212
MAN (10)	0.92	0.92	0.95	0.92	0.92	0.95
n	326	166	175	54	51	212
TECH (2)	0.49	0.71	0.65	0.68	0.73	0.76
n	325	163	175	55	59	211
LRN (2)	0.68	0.57	0.83	0.63	0.81	0.80
n	332	166	181	54	62	218

The combined projects Recommendation Framework 2.0 was extract from the full publication **“Towards the TIGER International Framework for Recommendations of Core Competencies in Health Informatics 2.0 – Extending the Scope and the Roles”**.

**Conclusion:**

The TIGER International Recommendation Framework of Core Competencies in Health Informatics 2.0 is based on a proven methodology and well on its way with global findings and local exemplar case studies. It contributes to the overall discourse how to shape health informatics education to improve quality and safety of care by enabling useful and successful health information systems. Furthermore, these findings should help stimulate the discussion within IMIA's work on educational recommendations.

**Resources:**

**EU\*US eHealth Work Project**

**Global case studies**

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