

Health Informatics

Kathryn J. Hannah
Pamela Hussey
Margaret A. Kennedy
Marion J. Ball *Editors*

Introduction to Nursing Informatics

Fourth Edition



 Springer

Health Informatics

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Kathryn J. Hannah • Pamela Hussey
Margaret A. Kennedy • Marion J. Ball
Editors

Introduction to Nursing Informatics

Fourth Edition

 Springer

ISCP 
International Society of Cardiovascular Pharmacotherapy

Editors

Kathryn J. Hannah, PhD, RN
Calgary
Alberta
Canada

Marion J. Ball, EdD, FACMI, AMIA
IBM Research Center for Healthcare
Management
Baltimore, MD
USA

Pamela Hussey, RN, RCN, MEd, MSc, PhD
Dublin City University
Dublin
Ireland

Margaret A. Kennedy, RN, BScN, MN,
PhD, CPHIMS-CA, PMP,
PRINCE2 Practitioner
Global Village Consulting Inc
Merigomish
Nova Scotia
Canada

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The authors of this book share many passions and values. The strongest of these is the incomparable value of family and friends. We dedicate this new edition to our family, friends, and wonderful colleagues for their generosity of support and inspiration.

Series Preface

The Health Informatics Series is directed to healthcare professionals who are leading the transformation of health care by using information and knowledge. Launched in 1988 as “Computers in Health Care”, to offer a broad range of titles: some addressed to specific professions such as nursing, medicine, and health administration; others to special areas of practice such as trauma and radiology; still other books in the series focused on interdisciplinary issues, such as the computer based patient record, electronic health records, and networked healthcare systems.

Renamed “Health Informatics” in 1998 to reflect the rapid evolution in the discipline known as health informatics, the series continues to add titles that contribute to the evolution of the field. In the series, eminent experts, serving as editors or authors, offer their accounts of innovations in health informatics. Increasingly, these accounts go beyond hardware and software to address the role of information in influencing the transformation of healthcare delivery systems around the world. The series also increasingly focuses on the users of the information and systems: the organizational, behavioral, and societal changes that accompany the diffusion of information technology in health services environments.

Developments in healthcare delivery are constant; most recently developments in proteomics and genomics are increasingly becoming relevant to clinical decision making and emerging standards of care. The data resources emerging from molecular biology are beyond the capacity of the human brain to integrate and beyond the scope of paper-based decision trees. Thus, bioinformatics has emerged as a new field in health informatics to support emerging and ongoing developments in molecular biology. Translational informatics supports acceleration, from bench to bedside, i.e. the appropriate use of molecular biology research findings and bioinformatics in clinical care of patients.

At the same time, further continual evolution of the field of health informatics is reflected in the introduction of concepts at the macro or health systems delivery level with major national initiatives in many countries related to concepts such as electronic health records (EHRs) and personal health records; public health informatics; and data analytics, eHealth and digital health with the associated data, terminology and messaging standards essential to clinical interoperability.

We have consciously retained the series title Health Informatics as the single umbrella term that encompasses both the microscopic elements of bioinformatics and the macroscopic aspects of large national health information systems. Ongoing changes to both the micro and macro perspectives on health informatics will continue to shape health services in the twenty-first century. By making full and creative use of the technology to tame data and to transform information, Health Informatics will foster the development and use of new knowledge in health care. As coeditors, we pledge to support our professional colleagues and the series readers as they share advances in the emerging and exciting field of health informatics.

Victoria, BC, Canada
Dublin, Ireland
Halifax, NS, Canada

Baltimore, MD, USA

Kathryn J. Hannah, PhD, RN
Pamela Hussey, RN, RCN, MEd, MSc, PhD
Margaret Ann Kennedy, RN, BScN, MN, PhD,
CPHIMS-CA, PMP, PRINCE2 Practitioner
Marion J. Ball, EdD, FACMI, AMIA

Preface

The publication of this 4th edition of *An Introduction to Nursing Informatics* is timely. Its core purpose is to act as primer for nurses searching for basic information on the topic of nursing informatics. Interest in health informatics and its relevance to eHealth is expanding at a dynamic pace. The commitment of funding by the World Health Organization (WHO), Pan American Health Organization (PAHO), European Union (EU) and United States (USA) indicates that the integration of informatics competencies and its associated role in eHealth service delivery is a key priority. As a profession, nursing is accountable for a significant contribution to health care service provision. Contemporary nursing practice is changing and, at the same time, facing a number of critical challenges. For example, two global issues that the profession is striving to address include high staff turnover and nursing skill mix shortages. Articulating the nursing contribution to holistic care is therefore as important now as ever. Nursing informatics continues to be an essential aspect not only in providing information about the profession but also in helping nurse leaders in their quest for the expansion of nursing knowledge and theory development.

Twenty-first-century medicine offers exciting opportunities for the nursing profession to engage with and develop within. An example includes the opportunity to contribute to the design of emerging eHealth models of care. Additionally, concepts relating to health ecosystems which can be used to transform and enhance health and social care in society are seeking nurses' expertise and imagination. There is a need to ensure that resources such as electronic health records and mobile technology (mTechnology) applications are pragmatic and fit for purpose. Nurses, often described as context experts, understand the flow of health care processes and are key agents in requirements identification and evaluation of systems under development.

In this edition, the editors have collected the best available evidence to inspire and support nurses to think critically about both current and future practice. This book is presented in such a manner as to encourage the reader to pause and reflect upon key concepts presented from the perspective of their existing practice domain. Starting with the fundamental concepts of nursing practice, information management and its relationship to informatics, this edition includes a number of

contributions from leading experts who have practised in the field of informatics over a number of years. Preparing nurses for engagement with initiatives relating to eHealth transformational programmes locally, regionally or nationally is supported with additional files for downloading from extras.springer.com. There is a strong emphasis on both education and continuous professional development, and the pedagogical framework used to devise the core learning activities is explained in Chapter 1. This book builds on previous editions and provides readers with a basic primer for searching information on the topic of nursing informatics. It includes online resources and tools to support the acquisition of informatics skills for future professional development. We hope you enjoy this 4th edition.

Victoria, BC, Canada

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Kathryn J. Hannah, PhD, RN

Pamela Hussey, RN, RCN, MEd, MSc, PhD

Margaret Ann Kennedy, RN, BScN, MN, PhD,

CPHIMS-CA, PMP, PRINCE2 Practitioner

Marion J. Ball, EdD, FACMI, AMIA

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Contributors

Marion J. Ball, EdD, FACMI, AMIA Clinical Solutions Healthlink, Inc.,
Baltimore, MD, USA

Anne Casey, RN, MSc, FRCN Royal College of Nursing, London, UK

Polun Chang, PhD Institute of Biomedical Informatics, National Yang-Ming
University, Taipei, Taiwan, ROC

Hélène Clément, RN, BScN, MHA, CPHIMS-CA Richmond Hill, ON, Canada

Julie Doyle, BSc, PhD CASALA and the Netwell Centre, Dundalk Institute
of Technology, Dundalk, County Louth, Ireland

Tracy Forbes, BComm Gevity Consulting Inc, Vancouver, BC, Canada

Joanne Foster, RN, DipAppSc-NsgEdn, BN School of Nursing, Queensland
University of Technology, Kelvin Grove, QLD, Australia

Ross Fraser, CISSP, ISSAP Sextant Corporation, Toronto, ON, Canada

Kathryn J. Hannah, PhD, RN School of Nursing, University of Victoria,
Victoria, BC, Canada

Christopher Henry Digital Media Engineer, Dublin, Ireland

Pamela Hussey, RN, RCN, MEd, MSc, PhD Lecturer in Health Informatics
and Nursing, School of Nursing and Human Sciences, Dublin City University,
Dublin, Ireland

**Margaret Ann Kennedy, RN, BScN, MN, PhD, CPHIMS-CA, PMP,
PRINCE2 Practitioner** Atlantic Branch, Gevity Consulting Inc,
Halifax, NS, Canada

Ming-Chuan Jessie Kuo, RN, MS Nursing Department, Cathay General
Hospital, Taipei, Taiwan, ROC

Shaio-Jyue Lu, RN, MS Nursing Department, Taichung Veterans General Hospital, VACRS, Taichung, Taiwan, ROC

Breane Manson Lucas Cerner Corporation, Kansas City, MO, USA

Stephen P. Murray, BSc, EBU, MBA, PMP, ISP, CPHIMS Whiteshadow Inc., Charlottetown, PE, Canada

Kathryn Momtahan, RN, PhD Nursing Professional Practice, The Ottawa Hospital and the Ottawa Hospital Research Institute, Ottawa, ON, Canada

Lynn M. Nagle, RN, BN, MScN, PhD Lawrence S. Bloomberg, Faculty of Nursing, University of Toronto, Toronto, ON, Canada

Paula Mary Procter, RN, MSc, FBCS, FIMIANI Department of Nursing and Midwifery, Sheffield Hallam University, Sheffield, UK

Sally Remus, RN, BScN, MScN Doctoral Student, Arthur Labatt Family School of Nursing, Western University, London, ON, Canada

Fintan Sheerin, BNS, MA, PhD, RNID, FEANS c/o School of Nursing and Midwifery, Trinity College Dublin, Dublin, Ireland

Sally E. Schlak, BSN, MBA The TIGER Initiative Foundation, Chicago, IL, USA

Anne Spencer, BA (Hons), MSc Partners in Education Teaching and Learning (PETAL), Dublin, Ireland

Beverley Thomas, RN, Cert Ed (FE). MPH. Dip HSM NHS Wales Informatics Service, Cardiff, Wales, UK

Lorcan Walsh, B. Eng, PWD CASALA and the Netwell Centre, Dundalk Institute of Technology, Dundalk, County Louth, Ireland

Karen Witting, MS, MA, BA IBM T.J. Watson Research Center, Yorktown Heights, NY, USA

List of Electronic Supplementary Material

Extra material available from Springer Extras page (extras.springer.com)

Chapter 1

Educational Template (PDF 235 kb)

Educational Template (PPTX 263 kb)

Learning Plan (PDF 445 kb)

Learning Plan (DOCX 98 kb)

Audio 1.1 Podcast discussing the overall design of this new edition (MP3 1886 kb)

Glossary for Introduction to Nursing Informatics (XLSX 46 kb)

Chapter 2

Educational Template (PDF 108 kb)

Educational Template (PPTX 120 kb)

Chapter 3

Educational Template (PDF 110 kb)

Educational Template (PPTX 133 kb)

Chapter 4

Educational Template (PDF 7160 kb)

Educational Template (PPTX 3625 kb)

Audio 4.1 Marion Ball: Naming Nursing Informatics as Specialist Area (MP3 6801 kb)

Presentation 4.1 History of computing and technology (PPTX 3527 kb)

Chapter 5

Educational Template (PDF 4179 kb)

Educational Template (PPTX 1665 kb)

Chapter 6

Educational Template (PDF 98 kb)
Educational Template (PPTX 127 kb)

Chapter 7

Educational Template (PDF 103 kb)
Educational Template (PPTX 116 kb)

Chapter 8

Educational Template (PDF 89 kb)
Educational Template (PPTX 125 kb)

Chapter 9

Educational Template (PDF 98 kb)
Educational Template (PPTX 128 kb)

Chapter 10

Educational Template (PDF 97 kb)
Educational Template (PPTX 115 kb)
Video 10.1 GRASP (Grace Reynolds Application and Study of PETO). An example of a popular administrative solution used for workload management. With permission from GRASP Systems International, Inc (MP4 50378 kb)

Chapter 11

Educational Template (PDF 98 kb)
Educational Template (PPTX 114 kb)

Chapter 12

Educational Template (PDF 103 kb)
Educational Template (PPTX 123 kb)
Audio 12.1 The role of the informatics nurse by Roy Simpson, RN, C, CMAC, FNAP, FAAN, current role Vice President, Nursing Informatics, at Cerner Corporation (MP3 17564 kb)
Audio 12.2 The role of the informatics nurse by Cheryl Stephens-Lee, RN, BScN, MScNI, Clinical Applications Consultant, Markham Stouffville Hospital, Markham, Ontario, Canada (M4A 11840 kb)
Audio 12.3 The role of the informatics nurse by Suzanne Brown, RGN, RM, BNs, MScHealth Informatics, Assistant Nurse Coordinator Computer Services, Mater Misericordiae University Hospital, Information Management Services Department, Dublin, Ireland (MP3 4834 kb)
Audio 12.4 The role of the informatics nurse by Dairin Hines, RGN, RCN, BSc, HSM, MScHealth Informatics, Clinical Informatics Manager, Temple Street Children's University Hospital, ICT Department, Dublin, Ireland (MP3 4567 kb)
Audio 12.3 Transcript (PDF 300 kb)
Audio 12.4 Transcript (PDF 37 kb)

Chapter 13

Educational Template (PDF 102 kb)
Educational Template (PPTX 116 kb)

Chapter 14

Educational Template (PDF 7160 kb)
Educational Template (PPTX 3625 kb)

Chapter 19

Educational Template (PDF 89 kb)
Educational Template (PPTX 120 kb)

Chapter 20

Educational Template (PDF 97 kb)
Educational Template (PPTX 123 kb)

Chapter 21

Educational Template (PDF 90 kb)
Educational Template (PPTX 127 kb)

Part I
Introduction

Chapter 1

Introduction

Pamela Hussey and Margaret Ann Kennedy

Abstract Chapter 1 introduces the reader to the structure and content of this new edition. Designed as an ebook, this fourth edition describes how the acronym CARE originally introduced in early editions by Hannah and Ball is now adapted and used to present content in four discrete sections. Educational tools devised to support the reader are also presented in Chaps. 1, and 3 distinct learning approaches; assimilative, productive and interactive/adaptive styles are explained. Each chapter has an associated learning template that can be downloaded at the end of the resource. In Chap. 1 the structure and presentation of the learning templates is also presented.

Keywords Introduction to 4th edition structure • Supporting educational resource tools • Learning approaches explained • The CARE acronym

Key Concepts

Introduction to 4th Edition Structure
Supporting Educational Resource Tools
Learning Approaches Explained
The CARE Acronym

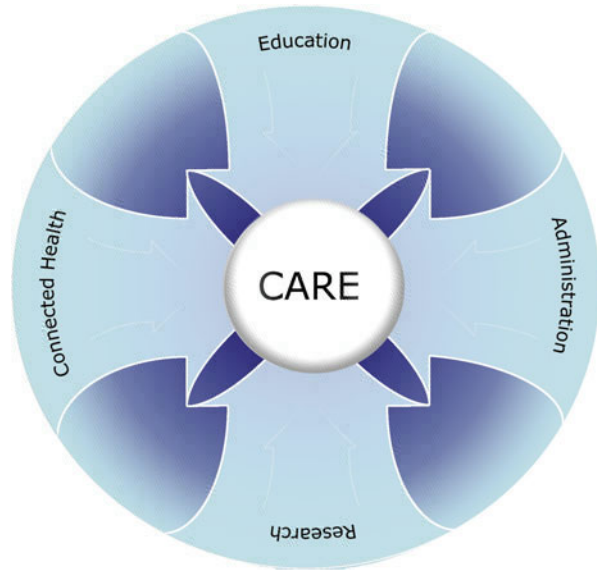
This 4th edition of Introduction to Nursing Informatics is designed for use with practicing nurses and students in undergraduate programmes of study. It presents the fundamental concepts of Nursing Informatics, and includes a number of contributions from leading experts who have practiced in the field of informatics over a number of years. As an ebook, the information is presented and integrated in a purposeful

The online version of this chapter (doi:[10.1007/978-1-4471-2999-8_1](https://doi.org/10.1007/978-1-4471-2999-8_1)) contains supplementary material, which is available to authorized users.

P. Hussey, RN, RCN, MEd, MSc, PhD (✉)
Lecturer in Health Informatics and Nursing, School of Nursing and Human Sciences,
Dublin City University, Dublin, Ireland
e-mail: pamela.hussey@dcu.ie

M.A. Kennedy, RN, BScN, MN, PhD, CPHIMS-CA, PMP, PRINCE2 Practitioner
Atlantic Branch, Gevity Consulting Inc, Halifax, NS, Canada
e-mail: mkenedy@gevityinc.com

Fig. 1.1 CARE (Connected Health, Administration, Research and Education) diagram 1: Introduction

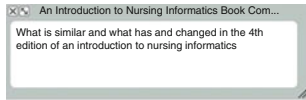


manner to encourage you to explore key concepts. We start with fundamental concepts in part one of the book, and then progress on to core concepts and practice applications in sections two through four. The content is linked with case based examples to contextualise the theory presented by authors. A content map which demonstrates the overall structure of the book is presented in Fig. 1.1 will be explained in greater detail in Chap. 2. Briefly, the word CARE is presented as an acronym for Connected Health, Administration, Research and Education and the book is organised sections into these sub themes. Part one is included as an introductory section. A podcast discussing the overall design of this new edition is available (Audio 1.1).

Writing this fourth edition presented us with a wonderful opportunity to build on the previous established editions of an *Introduction to Nursing Informatics*. Key objectives for us were to move beyond the initial ideas within the original score. Our focus is identifying what we believe to be the contemporary issues that nurses must understand in order to achieve competency for practice within both the current and future context of healthcare. Figure 1.2 offers you an illustrative example of what has changed between this fourth edition and the last edition of *An Introduction to Nursing Informatics*.

It is important that you have a clear understanding of how we have approached the process of developing this new edition. Our goal is to help nursing see the relevance of Informatics and appreciate what they are learning in the context of both their own and the authors' experiences. We have therefore also included in Fig. 1.3 for an overview of the methods adopted to draft this latest edition of the text.

The associated learning activities are presented at the end of each chapter in a template and the structure of the template is explained at the end of this introductory chapter (Fig. 1.4). As an ebook, it is important that you have an opportunity to view a site map of the content in order to synthesize the material in a structured and systematic way. In each chapter, a signpost will direct you to a set of learning activities designed to assist you to meet your personal learning objectives. Drawing on years of lecturing and teaching informatics in both face to face and online programmes, we advocate this as an effective way to maximise potential learning and understanding of the topic.



An introduction to nursing informatics book comparison

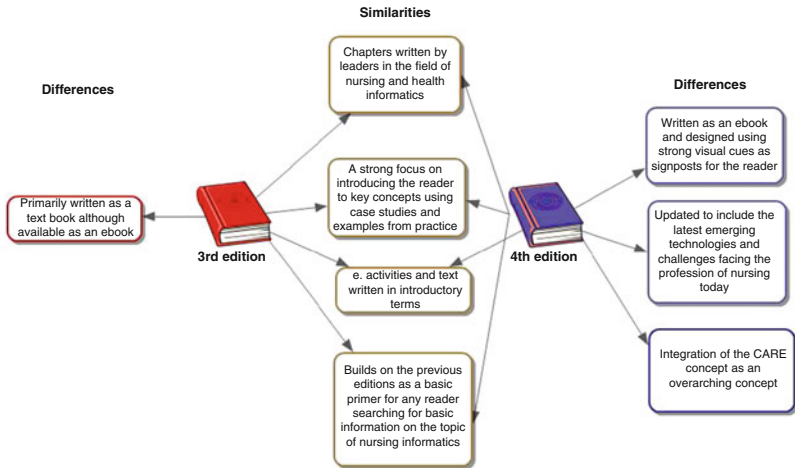
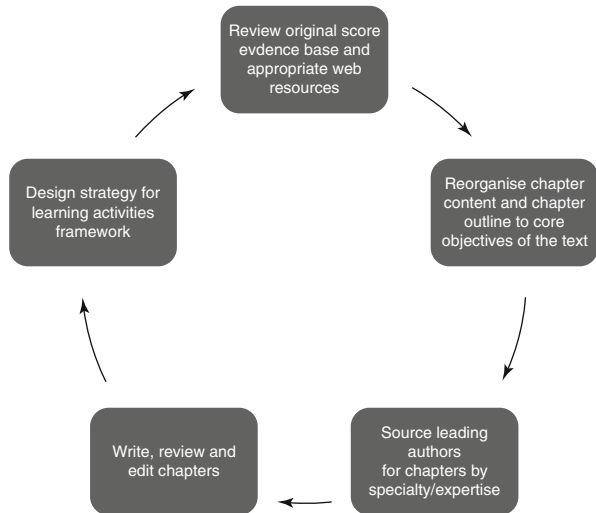


Fig. 1.2 Book comparison 3rd and 4th editions

Fig. 1.3 Approach to development of this new edition



Adopting Conolle’s (2013) work [1], three specific activity profiles are presented to assist you to learn. The first and largest activity profile is to review the material presented in this ebook by reading, watching, accessing and thinking about the informatics material presented. This process is known as assimilative activity. The second activity is to produce, list create, construct, compose, draw or write what you read and are assimilating, this process is called a productive activity. Finally we

The figure consists of six presentation slides arranged in a 3x2 grid. Each slide has a blue header and footer with the slide title and a vertical label on the right side.

- Slide 1 (Top Left):** Title: Educational template. Content: Chapter 1, Introduction, Pamela Hussey. Vertical label: Chapter 1 – Introduction.
- Slide 2 (Top Right):** Title: Key concepts. Content: In Chap. 1 the key concepts include:
 - Description and purpose of Educational Templates
 - Associated Resources
 - Structure of the CARE Model
 - Learning Plan
 - Associated Website
 Vertical label: Chapter 1 – Key Concepts.
- Slide 3 (Middle Left):** Title: Learning activity type. Content: There are three levels of activities as follows in each learning template:
 - Exercise 1 = Assimilative - Getting started
 - Exercise 2 = Productive - Informatics solution focused
 - Exercise 3 = Interactive/adaptive - Accelerated learning
 Vertical label: Chapter 1 – Learning Activity.
- Slide 4 (Middle Right):** Title: Anticipated value. Content: Each chapter has an associated learning template that can be used to assist the reader to assimilate and practice informatics skills. The anticipated value is explained in this particular slide in each presentation. Vertical label: Chapter 1 – Anticipated Value.
- Slide 5 (Bottom Left):** Title: Example of resources. Content: In the following slides is an example of the exercise activities from Chap. 2 and the Associated Learning Plan that is downloadable from extras.springer.com. Vertical label: Chapter 1 – Example of Resources.
- Slide 6 (Bottom Right):** Title: Example of Assessment Exercises from Chapter 2. Content:
 - e-Health is described by the World Health Organization as the combined use of electronic communication and information technology in the health sector**
 - Example of Level 1 Exercise:** Having reviewed this chapter, highlight what you think are the critical factors that require careful consideration in ehealth?
 - Example of Level 2 Exercise:** Take some time to consider what role nursing may have in the development of e-health resources in your practice to improve patient care. List the key concepts in a Wordle diagram <http://www.wordle.net>
 - Example of Level 3 Exercise:** Draw a mind map which illustrates the negative and positive impacts as well as the strengths and weaknesses that you would need to consider to demonstrate the nursing role in developing resources within the domain of ehealth. Examples of free mind mapping software include: <http://mvs42.com/> and additional links are available from Cloudworks <http://cloudworks.ac.uk/cloud/view/72201/links> & www.intro2nursinginformatix.com
 Vertical label: Chapter 1 – Example Assess Exercises.

Below the slides is a section titled "Screen shots of learning plan" showing two screenshots of a learning plan interface. The first is a "Learning Plan" overview, and the second is a detailed table with columns for "Activity", "Assessment", and "Resources".

Fig. 1.4 Educational activity template

would ask you to consider completion of the assimilative and production activities by engaging with interactive or adaptive activities. Such activities involve your exploring newly acquired information by experimenting, and simulating the

Fig. 1.5 Summary diagram of this process



information using design patterns with a view to you enhancing your practice. The blending of these three activities, with your practice experience in association with reading through this text offer you as a practicing nurse or informatics student, a fundamental understanding of what nursing informatics is. In this way informatics and its role can be located and understood within the profession of nursing. Figure 1.5 offers a summary diagram of this process.

Each of the learning approaches identified in Fig. 1.4 can be used by educators and trainers with different design tools to assist the student or practitioner to contextualise the material within the individual chapters. Drawing on the work of Conole in 2008 and 2013 [1, 2], specific learning activities can be used to abstract and transfer key learning material which can be cognitively processed by you and then applied to differing contexts. The following summary provides some examples of the tools that we have included within this ebook.

Summary of Learning Tools and Supporting Resources Included in This Book

Case studies are useful for developing and testing problem solving skills. They are used in this text to demonstrate a particular challenge relating to informatics within the nursing context that the student must overcome in order to achieve the desired outcome.

Rationale We have included case studies in this book to assist you to reflect on pertinent issues facing nursing today which informatics may have a direct impact on.

Design Patterns capture a recurring problem, the context in which it occurs and a possible method of solution derived from experience and backed up by theory. Design patterns often include an interactive learning pattern which is described by Conole in 2013 [1] as creating an interactive space for team work as well as interpersonal reflection. The pattern usually includes: lectures, keeping a diary, elaboration of a team project, self and or peer evaluation and summative assessment [1, p 42].

Rationale Nursing as a skill based profession engages in a dual role [3] being part of a team and working independently. Design patterns will assist you to achieve key attributes for self-development on informatics tools and their overall impact upon nursing practice.

Scenarios which can offer more current and future challenges facing practitioners can be used as test cases to demonstrate the validity and utility of patterns within the informatics domain [4].

Rationale Healthcare operates within a dynamic environment and the pace of progression with topical issues such as the eHealth agendas requires that the nursing profession can adopt and adapt to this changing environment. Using scenarios will assist nurses to recognise future nursing informatics requirements in their practice domain.

Visual representations such as mind maps or formalised diagrams to summarise or outline key points noted in the material reviewed.

Rationale Using mind maps will assist you to generate and link core concepts assimilated in the text. The process of mind mapping may include an associated hierarchy using images lines and links as well as random associations.

Role play often linked with visual representations such as mind maps or web searches to design discuss or report on material reviewed within a chapter [4].

Rationale Presents to you a learning opportunity to develop a greater awareness of the issues raised in a particular setting and can develop a more focused approach on the specific knowledge presented in a chapter. Role play demonstrates how well the learner understands the topic and provides dedicated time to apply what is learned to practice in a safe environment removed from the practice setting.

A Reflective practitioner exercise which encourages you to answer a question, make a judgement, or react to the material presented in the chapter. While this exercise can be completed as a stand-alone activity it is useful to complete this activity as part of a peer review exercise.

Rationale The advantages of reflection in practice and on reflective practice within the profession of nursing are well documented and are recognised as a credible educational tool [5].

In addition to the learning tools in this text we have also included some support resources to accompany the text. These include a website podcasts, a glossary, and in Chap. 4 a summary PowerPoint presentation. A brief description for these supporting resources is included in the following section.

Glossary

The glossary of key terms frequently used within the domain of nursing informatics has been included. You can search the glossary independently as a resource, or alternatively click on key words within the glossary for an explanation of the terms used in this resource.

Powerpoint Presentations

The purpose of including PowerPoint presentations with some of the chapters is to offer you the key points identified in the chapter in a short summarised format.

Podcasts

In some of the chapters we have included podcasts which are available to download in MP3 format. In all instances the podcasts are short in duration.

Downloads

Available from extras.springer.com:

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Educational Template (PPTX 263 kb)

Learning Plan (PDF 445 kb)

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Chapter 2

Nursing Informatics

Margaret Ann Kennedy and Pamela Hussey

Abstract This chapter introduces the reader to the scope and practice of nursing informatics. Contextualized across the health care system from an international perspective, the authors lead readers through an exploration of information and communication technologies (ICT), concepts related to eHealth and mHealth, and emerging topics such as clinical intelligence as they inform and support professional nursing practice. An overview of nursing informatics as a specialty practice distinct from health informatics and the evolution of definitions and competencies are also presented.

Keywords Health informatics • Nursing informatics • eHealth • mHealth • Nurse role • Evidence • Information

Key Concepts

Health informatics
Nursing informatics
eHealth
mHealth
Nurse role
Evidence
Information

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M.A. Kennedy, RN, BScN, MN, PhD, CPHIMS-CA, PMP, PRINCE2 Practitioner (✉)
Atlantic Branch, Gevity Consulting Inc, Halifax, NS, Canada
e-mail: mkennedy@gevityinc.com

P. Hussey, RN, RCN, MEd, MSc, PhD
Lecturer in Health Informatics and Nursing,
School of Nursing and Human Sciences, Dublin City University, Dublin, Ireland
e-mail: pamela.hussey@dcu.ie

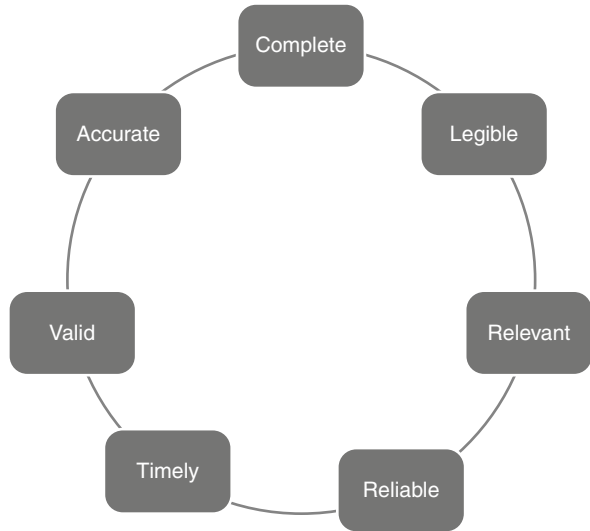
Introduction

This chapter offers an introduction on the fundamental concepts in nursing informatics. By exploring the topic from differing perspectives, it provides the reader with an insight into this rapidly evolving domain. In particular, it considers the relevance of informatics for the profession of nursing, its impact on clinical practice, and how nurses in the future can contribute to the development of eHealth systems ensuring that they are fit for purpose. Topics discussed in this chapter include:

- Health informatics
- Nursing informatics
- eHealth
- mHealth
- Nurse role
- Evidence
- Information

We are in the digital age. What does this mean to us as nurses? The convergence of the telecommunications and computer industry has seen a pervasive increase in how we communicate and process information. Social network communications and sensor technologies are available for use across the age spectrum of health care [1, 2]. Information and communications technology (ICT) underpins how we now complete business transactions, educate our children and how we observe the world in which we live. In healthcare, recent advances in mobile technologies and the patient-held record see the patient as an active citizen in the management of their health. The health care process is now moving beyond standard data processing for administrative functions common to all organisations such as human resources, and financial information systems. An ever-expanding and aging population with increasing cost projections suggests that eHealth is the preferred solution and can no longer be considered as an option. In 2010 A Digital Agenda for Europe [3] was launched, as part of the 2020 EU strategy, this initiative was devised to assist digital technologies to deliver sustainable growth within Europe. In 2012 the Pan American Health Organisation launched its eHealth Strategy and Plan of Action (2012–2017) [4] to improve health services access and quality, this strategy argues the case that access to health information is a basic right for citizens, and in 2012 launched an eHealth newsletter to improve and promote co-operation amongst countries. The concept of information as a valuable commodity comparable to oil was considered at IMIA NI2012 [5]. Whether or not this is the case it is reasonable to suggest that health and health information is increasingly considered important and internationally investment in eHealth is growing. One example is the European Union Digital Agenda strategy which outlines EU policy directly relating to health [6], a second example is the EU Horizons Research Programme in ICT [7] which begins in 2014 will invest 80 Billion in ICT research between 2014 and 2020.

Fig. 2.1 The dimensions of data quality see copyright permission p.11 Source HIQA website



Emerging eHeath Agenda

A key driver in considering eHealth is to consider the importance of health information. Safe reliable health and social care is underpinned by access to and use of quality data. It is the cornerstone on which the health care process is built and is critical for continuing care, strategic planning and management of the services. So what are the characteristics of health information? Figure 2.1 offers one example from the Health Information and Quality Authority in Ireland who define the international dimensions of quality healthcare data.

The concepts above are defined by HIQA as follows

1. **Accurate Data** refers to how closely the data correctly captures what is was designed to capture
2. **Complete data** has all those items required to measure the intended activity or event.
3. **Legible data** is data that the intended users will find easy to read and understand.
4. **Relevant data** meets the needs of the information users
5. **Reliable data** is collected consistently over time and collects the true facts
6. **Timely data** is collected within a reasonable agreed time period after the activity that it measures and is available when it is required and as often as it is required.
7. **Valid data** is collected in accordance with any rules or definitions applicable for that type of information. These rules check for correctness and meaningfulness before the data is used [8, p. 12–18].

An emerging area topic in the area of health information management is *clinical intelligence* (CI), which is defined as the “electronic aggregation of accurate, relevant and timely clinical data into meaningful information and actionable knowledge in