Week 1
Introduction

Kevin Robertson, MBA

ACS-3801-050 Principles in Information Systems

Fall 2020

General Information

- **Instructor:** Kevin Robertson, MBA
- **Office:** 2L17
- **Office Hours:** Tue 16:45 pm – 17:45 pm or by email appointment
- **E-mail:** ke.robertson@uwinnipeg.ca

- **Course Name:** Health Information Systems
- **Course Number:** ACS-2816-050
- **Course Web Page:** www.acs.uwinnipeg.ca/2816-001
- **Class Meeting Time:** Tue 18:00 pm – 21:00 pm
- **Class Room:** 3D03

Important Dates

- **First Class:** Monday Sept 14th, 2020
- **Reading Week:** Oct 11-17th, 2020
- **Final Withdrawal Date w/o Academic Penalty:**

  Tues Nov 17th, 2020 (A minimum of 20% of the work on which the final grade is based will be evaluated and available to the student before the voluntary withdrawal date)
- **Last Class:** Mon Dec 7th, 2020
- **Final Paper Submission:** Mon Dec 14th, 2020

Evaluation Criteria

- Assignments 25%
- Term Paper 50%
- On-line quizzes 25%

Evaluation Criteria - Assignments

- **Assignments (25%)**
  - There will be 2 assignments worth 12.5% each
  - All assignments are to be completed individually
  - May include any or combination of the following:
    - Theory and/or analysis homework exercises
  - Due at the beginning of class on due dates. Electronically submitted (email), hand written assignments will not be accepted.
  - No late assignment will be accepted, or under special circumstances accepted with 20% off for each late day
  - Multiple submissions are not permitted. Students may submit a partially completed assignment, and will receive credit for those attempted problems
  - Students are responsible to review their assignments before submission to make sure the correct files are attached to the email

Evaluation Criteria - Quizzes

- **On-line Quizzes (25%)**
  - open-book in-class quizzes performed in class
  - Student must be on-line to take the quiz and visible to lecturer using Zoom
  - Quizzes will be time controlled and will be done after class lecture

Evaluation Criteria – Term Paper

- **Term Paper (50%)**
  - Study a current article related to the course
  - Can be completed in a team of 2-3 students or individually
  - Submit a detailed report relating to the article (min 30 pages)
    - Individually submitted – minimum 25 pages
    - Team, 25 pages per team member
  - Prepare a PowerPoint presentation
  - Present article summary in class by using the PowerPoint presentation

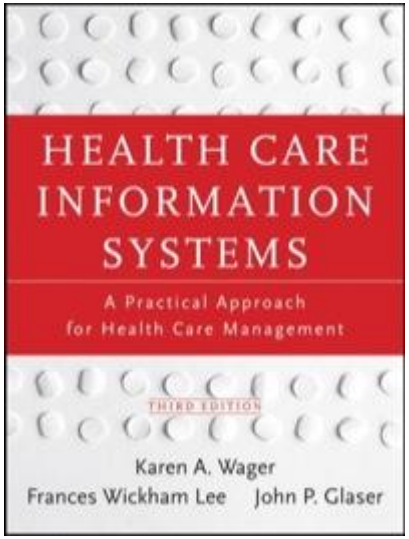
Email Communication

- It is recommended Email from accounts at uwinnipeg.ca be used in electronic communication related to the course

- Email from other accounts have greater risk to be filtered by UofW email system spam filters

Text Book (Required)

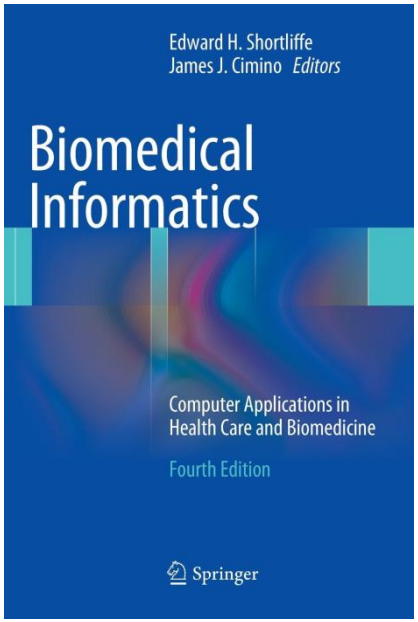
Healthcare Information Systems
Wagner, KA; Lee, FW; Glaser, JP;
4th Edition 2017
ISBN 978-1-119-33718-8
(Paperback)
ISBN 978-1-119-33712-6 (eBook)



Optional Text Book

Biomedical Informatics,
Computer Applications in Health Care and Biomedicine
Shortliffe, E. & Cimino, J. (Eds)
Springer
4th Edition 2014

ISBN 978-1-4471-4473-1 (Hardcover)
ISBN 978-1-4471-4474-8 (eBook)



Week 1 Outline

- Course Overview
- Principles in Information Systems
  - Shared Services – Building a Shared Services Model
  - What is a Shared Service
- Health Care Data
  - Collection
  - Information Management
  - Protection
  - Integrity

Three Questions

- How is the course organized and managed?
- What is a Shared Service?
- Why is Managing Health Data Important?

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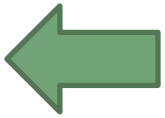

Course Objectives

- This course is the final course for the 3 year degree in the Information Systems and the Health Informatics streams. The course can provide integration (e.g., project management), or provide more depth in specific areas of Information Systems in order to address specific thematic needs.

- The work undertaken in class will assist in the delivery of a cumulative final paper that encapsulates many facets of the previous classes taken by the student - but will entail a direct relationship to Health Information Systems.

- Rather than take a project management approach to the delivery of information systems this class will focus on Service Delivery at operational, tactical and strategic levels. Thus the student will understand a framework for managing electronic systems in a shared services model approach.

Course Outline (Tentative)

A Services Delivery Based Approach to Health Information Systems

- Overview
- Shared Services - Building a Services Model
- Health Care Data
- Service Description
- IT Value
- IT Strategy

Services – Selection, Evaluation and Implementation

- System Selection
- System Implementation
- Assessing Value
- Organising Information Technology Services

Laws Regulations and Standards

- Privacy and Security
- Performance Standards and Measures
- Standards

1. Senior Level (Strategic) Management issues

- IT Alignment and Strategic Planning
- IT Governance and Management

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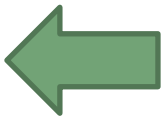


Principles in Information Systems

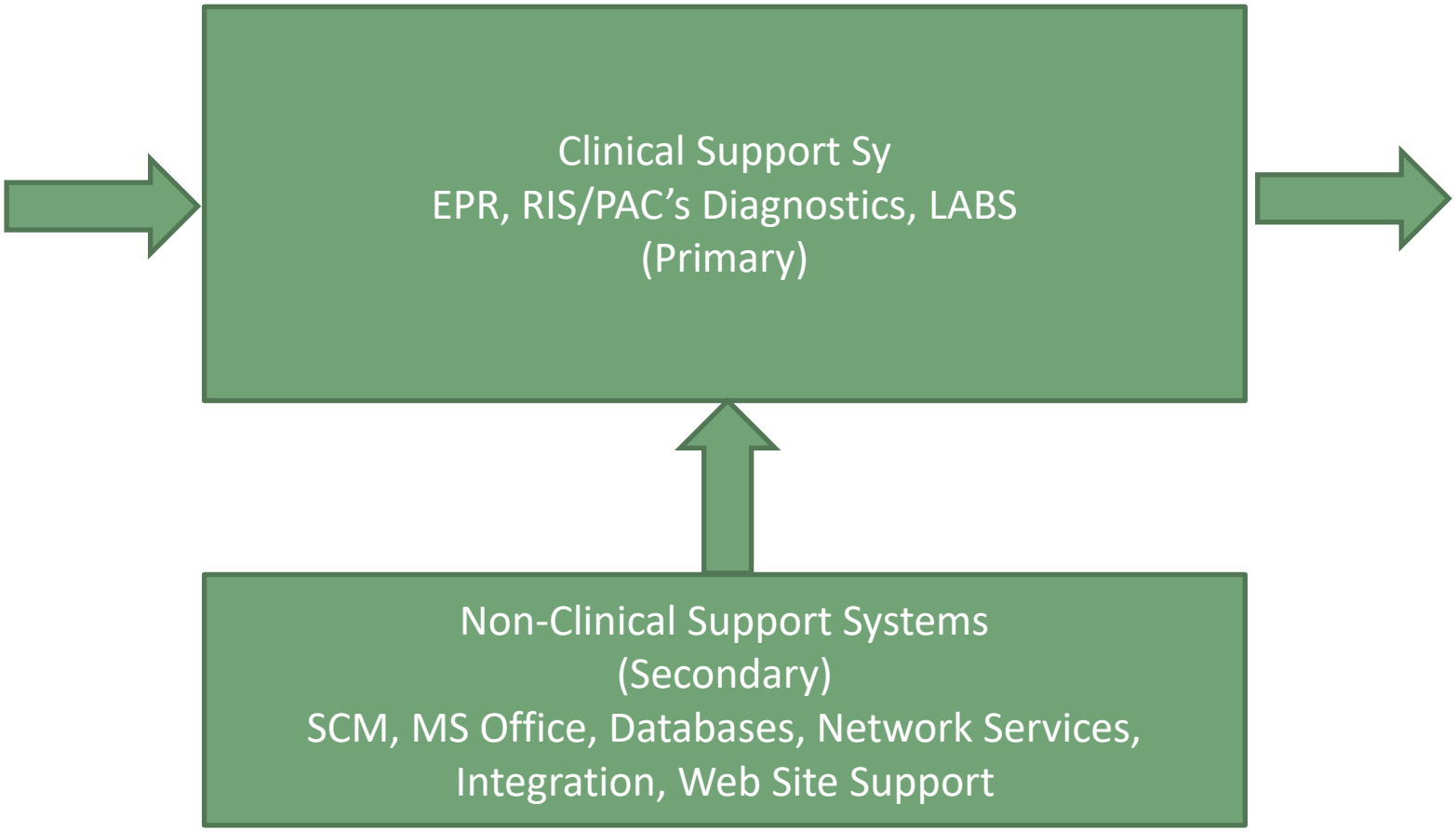
- The principles to be covered are focused on Healthcare Information Systems
- Can be applied in practice to many other businesses and industries
- Discuss the basic building blocks required to manage ICT investments in Clinical (Primary) and Office Support (Secondary) services
- This course relies in many ways on the teachings in ACS 2816 – Health Information Systems but focuses more on delivery of Health ICT

What is Health Informatics?

- **Health informatics** is the field of information science concerned with management of healthcare data and information through the application of technologies
  - Interdisciplinary field
  - Assists caregivers and patients with decisions and actions
  - Improves patient outcomes by better use of information

- AKA Medical Informatics, Clinical Informatics, **Biomedical Informatics** among others

A Services Delivery Based Approach to Health Information Systems



Services Based Model for ICT Delivery

- Provides a model in which services are provided to users that are consistent across the span of the healthcare system
- Services are developed that integrate with other services and utilise standard patterns and services
- Cost effective scalable approach that expands scope of a service
- Reduces resource waste
- Improved support model
- Cleary identified and managed services

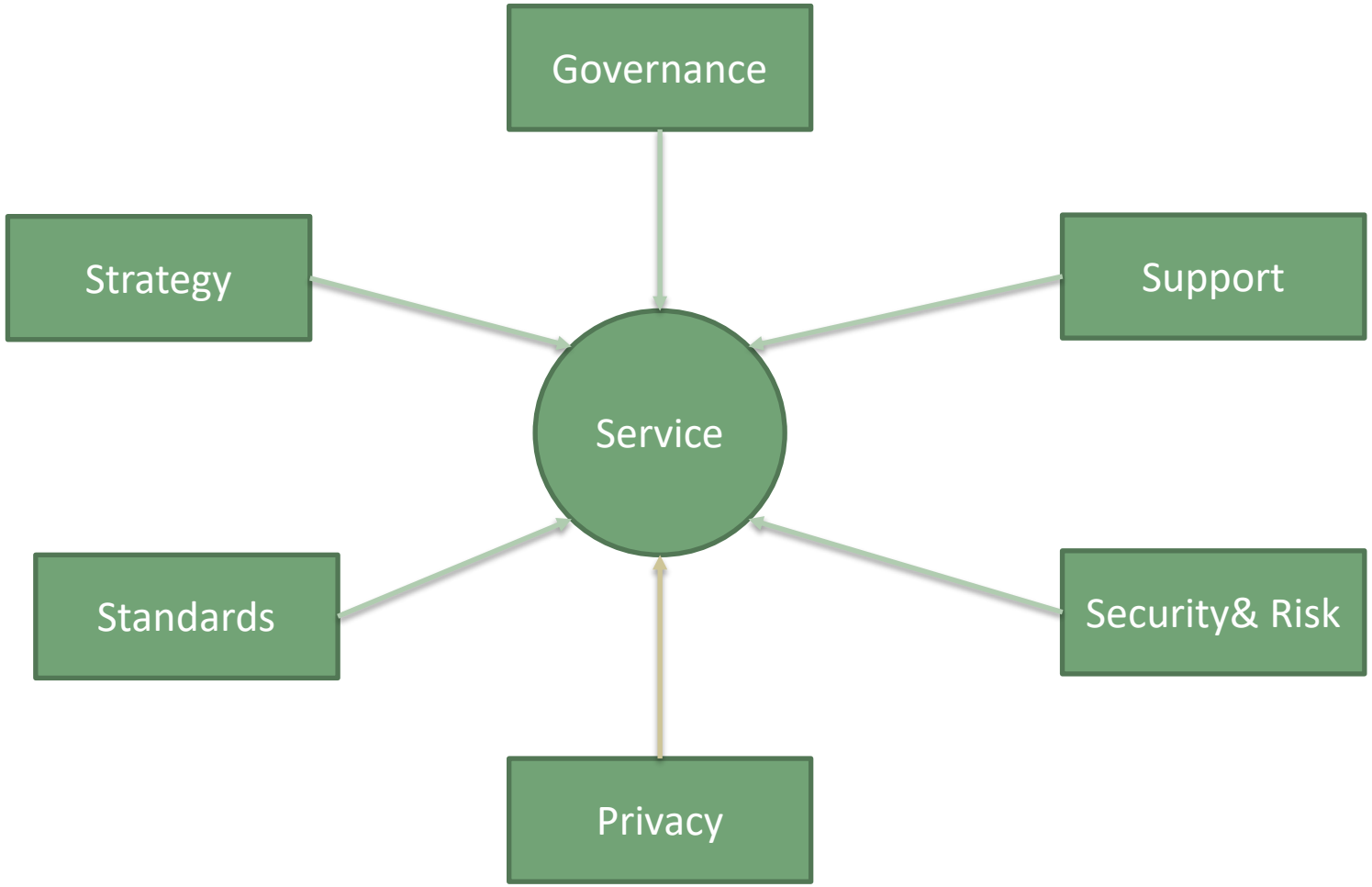
Services Implemented based on Clinical Strategy, e.g. Patient Care Plan

- Health Care Service Providers use a strategy and plan to identify services that are required in order to provide the level and type of patient care they want to deliver
- Services once identified need to be implemented and managed.
- For example the Electronic Patient Record (EPR) is a service which provides the basic patient information system
- Other services can be integrated into EPR to create a Patient Information Ecosystem
- EPR will consume other ICT services in order to operate, i.e. network, database, software development, security, privacy and more….

Services Model

- Reuse services that already exist
- Create new services where none exist
- Consolidate siloed services into single services
- Leverage economies of scale
- Simplify support models, vendors and products consumed in the healthcare system
- Consolidate technologies
- Streamline patient care processes
- Philosophy applied to Primary and Secondary services

Controlling and Managing Services



Controlling and Managing Services

- Strategy
  - Health organisation has a vision and plan for short and long term objectives
  - Service Identification
  - Where does it fit into the clinical (primary) care plan
  - Or
  - Where does it fit in the non-clinical (Secondary) services plan
  - The service needs to be “described” what is it, what does it do, what does the user/business need in order to consume the service
  - Where does it add value to the patient care process?

Controlling and Managing Services

- Governance
  - Review and oversight of services
  - Finance – is there funding and resources for the service
  - Approve – aligns to strategy and target criteria
  - Reject - Does not align with the strategy or target criteria
  - Provide resources and funding
  - Reporting (performance, meeting objectives, ROI)
  - Intake Management – business requests for new services

Controlling and Managing Services

- Support (Operations)
  - Service Owner
  - Support Team
  - Funding to Manage Service
    - Licenses, staff, contract resources, materials etc.
  - Service Description
    - What is the service
    - Who can consume it
    - Chargeback/fee for service
  - Service Level Agreements (SLA)
  - Business hours, 7*24* 365
  - Customer/Client Support (service desk)
- Change management
- Customer communications
- Processes and Practices (the how, who what and the where)

Controlling and Managing Services

- Standards
  - Clinical (external)
    - Information (SNOWMED, LOINC etc.)
    - User Audits (ATNA)
  - Technology (internal)
    - Interoperability/Integration (HL7, FHIR, Web Services)
    - Database type (Oracle, MS SQL)
    - Network equipment
    - Clinical devices
    - Vendors (sole source vs vendor selection)

Controlling and Managing Services

- Security & Risk
  - Risk Management and Assessment
    - Internet facing vs Internal
    - Possible impacts to business
    - Disaster Management
  - Threat Assessment
    - Penetration Tests
    - Compatibility
    - Architecture compatibility
    - Known problems
    - Relies on external information resources for support

Controlling and Managing Services

- Privacy
  - Patient Data, PHI,
  - Data access and control
  - Data lifecycle management
  - User audits
  - Sharing data with other systems
  - Threats and risks to sensitive data/information
  - Information research and analytics
    - Who will consume
    - Data cleansing (de-identification)
    - Original Data Re-engineering

Common Shared Services Model

- Simplifies growth of the health information system
- Makes it easier to interconnect and consume common services
- Easier to replace with newer, improved and safer services
- Allows incremental consolidation and transformation of services
- Documentation is a critical part of the service to accurately describe what a service is and how it is consumed

Typical examples of Shared Services

- Client Registry – service tool that manages all clients in a healthcare system
- EPR – standard application to support the patient record
- RIS/PACS, standard digital imaging application and image archive
- ICT Network
- Integration Services
- Application Development Team
- Service Desk (Client Services)
- Change/Release Management

Health Care Data

Reading: Health Care Information Systems Ch 2, Health Care Data, p21-59

Health Care Data

- Data used to support service areas is complex
- Therefore it is critical to ensure standards are built into the applications and services so that data is transportable between the areas and is still “useful”
- It is critical in that respect that data entered into these systems is validated and checked before updating and critical data values are not missing (managing data quality)
- By managing data quality at the lowest levels helps to ensure that the information driven from the systems is useful and provides a better basis for research analysis

Health Care Data

Issues:-

- Availability
- Consistency
- Easily searched
- Data entry methods

Health Care Data

- EHR's are an evolving technology, in some ways they are relatively new unlike for say banking systems which have existed for 60 years or more and they have evolved to become highly integrated to allow transactions from one bank to another – safely and accurately

- EHR and other systems are slowly making their way along the same path

Health Care Data

Data -> Information -> Knowledge

- Health Care Data is often classified as Datum because a single value is meaningless but needs some other value, e.g. a a point in time to make it useful data

- Patient temp is “36.6C” (data)
- Patient temp is “36.6C at 9.15am” (datum)

Health Care Data

Data -> Information -> Knowledge

- Information – Patients temperature has dropped from 38.6C down to 36.6C in 8 hours since he was given the antibiotics

- Knowledge: The reduction in body temperature may have been related to the taking of the antibiotic (but more tests may be needed)

Health Care Data

Data -> Information -> Knowledge

- In effect processed data creates data and at a higher level we can extract knowledge for the analysis and interpretation of the information collected

Health Care Data

- These issues can be related to the types of systems and process by which the data was originally entered
- This takes us back to the initial concepts of the Electronic Health Record (EHR) and the Electronic Medical Record (EMR)
- EHR encapsulated the complete history of the patient all related data
- EMR effectively details the patient chart (old paper based model) in a particular event, however EMRS are generally independent applications used within a clinic which may not be integrated into the EHR, therefore data needs to be transferred from one system to another with potential data vocabulary differences
- In effect EMR can be an originating source of data quality issues, even though they may be effective as a solution in a given site

Health Care Data

- EHR data covers a complex set of areas
  - Patient Care – treatment, care pathways
  - Communication between patients and caregivers
  - Legal documentation
  - Billing and reimbursement
  - Research and quality management
  - Population Health – measure population health and investments into health system, is the system working?
  - Public Health – develop policies and practices to protect patients (disease prevention)

Health Care Data

- Data that is collected must be re-usable in order to be effective
- Data analysis is a key tool to understanding data and making it usable as both information and knowledge
- Source systems (like EHR, RIS/PAS/Diagnostics) provide the raw data that is transformed in Information and knowledge
- Presentation of the facts must be done in a meaningful manner, e.g. reports and dashboards

Databases

- Databases provide the source facts that are used in analysis
- These databases support the primary application it was designed for
- A Data Warehouse is a collection of extracted and transformed data from many applications (services)
- Transforming the data is necessary in order to make it reliable and consistent, e.g. a date field format or clinical diagnosis definitions
- Typically it also involved value aggregation, counts,

Small vs Big Data

- Small data sets are generally application or service specific
- Big data is refence to very large volumes of data that is not necessarily in data store and is not specific to a given tool (e.g. Cognos)
- Big data uses complex data sets of many different types and uses the data as it travels through a system, not necessarily landing in a particular data warehouse
- Can answer complex questions in real-time and not just point questions related to a single service

Small Data

- Data in a single service can be analysed to answer basic questions related to the service itself
  - How many patients arrived at the ER on Monday
  - What is the average time for a patient to travel through a care plan?
  - How many patients have taken drug xyz?
  - How much does a heart by-pass operation cost?
- Statistics are very useful to understand how a treatment or process is working and how a service is performing
- This can be linked back to the Health Care Plan Objectives

Big Data

- Consumes data from internal and external services and devices
- Goes beyond just clinical data – it can include data collected from the Internet of Things, personal wearables and devices, social media and regional data
- Data transmitted between systems (HL7) can be analysed in transit to look for patterns that can lead to pre-diagnosis of health problems

Big Data

- Post Market surveillance of medication and device safety
- Comparative effectiveness research
- Risk assignments potential for readmission
- Novel diagnostic and therapeutic algorithms
- Real-time status and surveillance, abnormal test results and patient compliance
- Machine correction of data-quality problems (automation)

Big Data – 5 areas of focus

- Population Management Analytics
- Provider profiling/physician performance analytics
- Point of Care (POC) Gaps
- Disease Management (COVID-19!)
  - Define best practices
- Cost Modelling/performance and risk management/comparative effectiveness

Health Care Data Quality

- In order for analysis, research and modern methods to be efficient we must manage data quality across the span of all systems and services

- Data Quality
  - Conformance to standards and specifications
  - Fitness for use
  - Goes beyond Reliable, efficient, timely, accurate etc.

- Problem – the measurement of data quality is dependent on what the data is to be used for

Health Care Data Quality Issues

- EHR's are evolving
- New questions arise
- New Data facts are needed
- Standards enforce data quality – but we need to know who the users will be in order to determine what standards are needed
- Structured vs unstructured
  - Users might prefer unstructured, data analysts want structured

Health Care Data Quality Issues

- Missing data – gaps in collected data
- Data only collected that is relevant to a specific encounter
- Not all questions asked at the point of care
- Documentation not complete at the time
- Follow up notes not added to record
- The methods individuals use to ask and record data will differ, may be interested in “no” (negative responses)
- No single common standard to measure data quality

AHIMA Data Quality Characteristics

AHIMA defined and published a set of health data quality characteristics

- Accuracy – valid values are accurate, typo's are inaccurate
- Accessibility, can the users access the data they need?
- Comprehensiveness – all relevant data that is required is present, available and complete
- Consistency – ensure values are used in the same way
- Data Currency – what data is used to answer question being asked, which is relative to a point in time (is current)

AHIMA Data Quality Characteristics

- Definition – documents and defines each data element
- Granularity – break down data into is most useful elements but not too much, e.g. date field does it need to be broken into 3 values or just one “yy/dd/mm”
- Precision – ensure proper values for measures, units of scale, volumes, number of decimal places
- Relevancy – data must be relevant to purpose for use and do not capture date that s irrelevant
- Timeliness – data is available when needed!

Strategies for Minimising Data Issues

- Data standardisation requires clear concise definition
- Use a Data Dictionary
  - List of data names and attributes i.e. Data type, ranges, character length
- Manage data input against erroneous data input (user errors)
  - Random vs Systematic = user vs system
- Use the software to protect data quality!

Strategies for Minimising Data Issues

- Develop or Create a Data Quality Program within the service
- May necessitate the development and creation of specialist “Data Integrity” Teams
- Use automation (software scripts, database procedures, nightly batch programs) to clean data and remove errors
- Standardise processes for data entry and validation
- Real-time checks
- Well designed user interface, (have the users validate)
- Follow guidelines for documenting care provided
- Create awareness of data integrity issues, provide training

Summary

- Health Data must be managed to ensure it is useful across the span of a Health Care System – go beyond points of case and siloed services
- Data Quality is an issue that threatens the effectiveness of the HIS
- Quality needs to be built into the applications and services
- Organisations must create models for supporting data quality e.g. Data Integrity Units