

Fundamentals of Health Workflow Process Analysis and Redesign

Unit 10.2.1 Process Mapping Theory and Rationale

Component 10/Unit 2

Health IT Workforce Curriculum
Version 1.0/Fall 2010

Slide 1 

Welcome to the Process Mapping Unit. This unit is from the Fundamentals of Health Workflow Process Analysis and Redesign component. In two parts, this unit covers the background necessary for graphically representing processes; and it uses flowcharts and basic flowchart symbols to provide an introduction to graphical process representation, also called process diagramming. A separate unit covers complete symbol sets and conventions for different types of process diagrams.

Upon successful completion of this Unit the student is able to:

- Describe the value of process diagrams
- List the process steps from a healthcare scenario
- Describe basic flowchart symbols
- From a workflow process chart consisting of basic flow charting symbols, list the information generated or used in the process and the sequence of workflow steps.
- Read a scenario and use basic flowchart symbols to represent the process steps and their sequence
- Explain two ways process diagrams are used as models
- Distinguish the physical steps from information flow in a healthcare process involving an EHR
- Choose an appropriate process diagram to model given aspects of a process

After completion of this unit, you should be able to:

1. Describe the value of process diagrams
2. List the process steps from a healthcare scenario
3. Describe basic flowchart symbols
4. Working from a workflow process chart consisting of basic flow charting symbols, you should be able to list the information generated or used in the process and the sequence of workflow steps.
5. Read a scenario and using basic flowchart symbols represent the process steps and their sequence
6. Explain two ways process diagrams are used as models
7. Distinguish the physical steps from information flow in a healthcare process involving an EHR
8. Choose an appropriate process diagram to model given aspects of a process

Unit 2 Topic Outline

- 1.0 Purpose of graphic process representation
- 2.0 Process diagram vocabulary
- 3.0 Identifying process steps
- 4.0 Basic flowchart symbols
- 5.0 Creating a basic flowchart
- 6.0 Process representation concepts
 - 6.1 Models, templates and abstracts
 - 6.2 Data flow versus process steps
- 7.0 Aspects of processes that we might need to model
- 8.0 Selecting the right diagram type

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Slide 3 

There are 8 topics covered in this unit. They include:

- 1.0 Purpose of graphic process representation
- 2.0 Process diagram vocabulary
- 3.0 Identifying process steps
- 4.0 Basic flowchart symbols
- 5.0 Creating a basic flowchart
- 6.0 Process diagram concepts
 - 6.1 Models, templates and abstracts
 - 6.2 Data flow versus process steps
- 7.0 Aspects of processes that we might need to model
- 8.0 Selecting the right diagram type

Communicating with Symbols

Since the beginning of human history, people have used symbols to communicate.



Before written language, early humans used symbols to communicate. While we aren't sure if a picture is really worth a thousand words, we do know that with some graphic representations, humans perceive more information and perceive the information faster than through verbal and written communication channels¹.

1. Wickens CD, Hollands JG. *Engineering Psychology and Human Performance*. 3rd ed. Upper Saddle River, NJ: Prentice Hall, Inc; 1999.

Humans perceive meaning directly from symbols



A graphic representation of a process works the same way. Standard symbols are used to convey meaning.

Humans directly perceive meaning through symbols. For example, the skull and cross-bones is a universal symbol for danger. This symbol was used to label household poisons, however, children associated the skull and cross bones with pirates, so the [Children's Hospital](#) of [Pittsburgh](#) created the Mr. Yuck symbol. A picture of a telephone indicates that there is a phone available for public use, and a road sign with a picture of a tipping truck lets drivers know that the road conditions are conducive to rolling vehicles. When it is important to communicate meaning quickly, we use signs and symbols.

Process Maps Provide



Partial map of the Washington DC Metro rail system

- A pictorial representation of the “whole”
- A commonly understood representation of a process
- A way to focus attention on important aspects
- A way to make the process explicit
- A way to document and share knowledge about a process

These concepts have been applied to clearly communicate process information, for example, the steps and their order in a work process. Process maps are graphical representations of processes. They use standard symbols to communicate information about a process. The symbols communicate meaning, much like road signs. Process diagrams often are drawn at a level of detail that enables them to fit on one or a few pages. As such, they provide a way to, in one place, see the whole process. Process diagrams show different aspects of processes. Similar to subway maps where the map in the station shows the color of the lines, and the stops on each line, rather than the local highways that are less relevant to riders. Lastly, the act of documenting a process requires that each step be understood and made explicit. This makes the knowledge about the process steps and relationships between them easier to share.

While on the surface, this seems simple, most processes are complex systems. They can be examined and viewed from different perspectives, including static and dynamic aspects, data flow versus workflow, and at different levels of detail. Process diagramming provides the ability to smoothly progress from abstract to detailed. Additionally, process diagrams are multidimensional, conveying different types of information about a process. Different types of diagrams are used to make explicit and document the “who, what, when, where, and how” of processes.

Example: Process Perspectives

- **Looking up a restaurant phone number in the yellow pages involves:**
 - physical and mental steps
 - exchange of information
 - This process can be described at different detail levels
 - “obtain phone number”
- versus**
- open search engine,
 - find electronic yellow pages,
 - type text name of restaurant and zip code,
 - visually inspect returned results,
 - select the one you were looking for

Consider the steps that you take to look up a phone number in the yellow pages. You might describe this as “looking up the number”, i.e., you may describe this as one process or task, that is, at a high-level. Or, you may describe it at a more detailed level and list each of the individual tasks that make up the larger task of “looking up a phone number”.

Processes also involve both physical and mental steps. Some of the physical steps include clicking to open the web browser, typing the URL for the phone book, and scrolling through the search results. Some of the mental steps are locating the icon to start the web browser, remembering the URL for the search engine or locating the link to the search engine or going directly to the yellow pages, and assessing each search result to decide if it is the restaurant that you are looking for.

The information exchange can be described apart from the workflow or process steps, for example, the user requires a data value (phone number for a certain restaurant), the user queries the yellow pages data store through the internet, then a set of potential data values is returned.

Process Vocabulary

- Process
- Process map, process diagram
- Task
- Workflow
- Data flow
- Flowchart
- Notation
- Symbols

In the previous slides and example, we have introduced terms that may be new, or that may be used in a different way. In the next few slides, we will discuss and define the following terms that are used in workflow and data flow diagramming.

Process

- A process is a series of steps and decisions involved in the way work is accomplished¹.
- Everything we do in our lives involves processes.
- The health care system is an interconnected web of many processes.
- “A complex system that works is made up of simple systems that work.”

First, we will look at the process.

A process is a series of steps and decisions involved in the way work is accomplished¹.

Everything we do in our lives involves processes. Some examples are preparing for work in the morning, cooking a meal, and scheduling an appointment with your doctor.

The health care system is an interconnected web of many processes.

John Gall in his book Systemantics, stated that “A complex system that works is made up of simple systems that work.”

Process Map

- A visual representation of a process that shows
 - the boundaries, i.e. where the process begins and ends.
 - the steps or tasks in the process
 - the sequence or order of the steps
- Use standard symbols so that a process map created by one person can be understood and used by others
- Different approaches use different symbol sets.
- Also called process diagrams and flowcharts.

A process map is a visual representation of a process that shows:

the boundaries, i.e. where the process begins and ends.

the steps or tasks in the process

the sequence or order of the steps

Process maps use standard symbols so that a process map created by one person can be understood and used by others

There are different approaches to process diagramming, each with its own symbol set.

Process maps are also called process diagrams and flowcharts. However, there are more precise uses of these terms that we will cover

Task

- A task is a step in a process.
- A task is a physical action that a human or machine performs, or a mental action that a human performs.
- Some tasks may be decomposed into smaller tasks.
- The smallest tasks, i.e., those that can be decomposed no further are called primitive or atomic tasks.

A task in process lingo means the same as it does in everyday use; a step in a process. We further differentiate physical and mental tasks, as well as higher-level tasks that are composed of smaller tasks, and primitive tasks that can not be broken down into smaller or sub-tasks.

Example: Process Tasks

List the process tasks required to schedule an appointment with your physician using an on-line scheduler.

Now, we will look at an example.

After these instructions, pause the slides. List the process tasks required to schedule an appointment with your physician using an on-line scheduler.

Pause the slides now.

Task List

1. Identify the need for an appointment
2. Sign on to a computer
3. Open a search engine,
4. Find electronic scheduler for your physician
5. Search for acceptable dates and times
6. Visually inspect returned results,
7. Select the date and time,
8. Confirm the date and time.

Let's go through this example step-by-step.

First, you must identify the need for an appointment

Then, you will sign on to a computer,

Open a search engine,

And find an electronic scheduler for your physician

Next you will search for acceptable dates and times by

Visually inspecting results from the scheduler,

Finally, you will select the date and time,

And then Confirm the date and time.

Workflow versus Dataflow

- Workflow is usually defined as a sequence of connected steps or tasks.
- Dataflow involves the transformations (operations) performed on data as it moves within and between systems.
- Data and information are often part of workflow, and vice versa.

The distinction between workflow and data flow is sometimes very blurry. However, the distinction is important because the underlying thing being represented, i.e., tasks versus information, is different. Dataflow is about data and information content. Often the mechanism and steps by which it is moved are unimportant. In data flow what we care about are the data points that are being communicated or transferred, where the data are stored, and how those data are transformed. In the phone number example, we just care about the data values returned by the search, and about where the data are stored, so we know where to search. On the other hand, for workflow, we care about the physical and sometimes mental steps that occur. In the phone number example, these steps are the clicking the mouse to open the browser, then the clicking to open the search engine, then the typing in the search text, then the results being returned and the scrolling and assessment of each result. Often, as in the phone number example, processes have both workflow and information components that need to be represented. Sometimes, the emphasis on one or the other is less, and one representation can be used, often, both are important and multiple diagrams are required.

Flowchart

- Flowchart is defined by Merriam-Webster dictionary as a diagram that shows step-by-step progression through a procedure or system especially using connecting lines and a set of conventional symbols³.
- Flowcharts have been used to diagram the logic paths through computer programs⁴, AND the tasks of work processes⁵.

“Flowchart” is probably the word that has come to mind most often so far in this presentation. The reason that we have not used the word flowchart, is that flowcharts, in common use today, blur and muddy the two different concepts of data flow and workflow. Often both are shown intertwined on a flowchart, and the chart is an incomplete representation of both the data flow and the workflow. Purely for didactic purposes, we make this distinction between work and data flow, because it is important for the analyst to be clear and to deliberately make decisions about what aspects of each (data flow and workflow) to show on a diagram.

Flowcharts are the most common type of process map, and are easily understood by most people, thus, they are widely used. Most of the symbols needed to create flowcharts are included in word processing, drawing, and presentation software packages, such as the Microsoft office packages.

Notation and Symbols

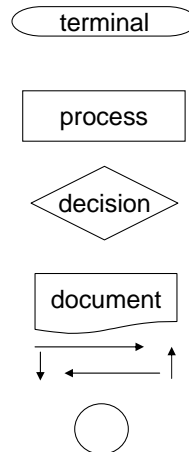
- The word notation is used to refer to the shapes and conventions used to diagram a process. There are several different notation formalisms in use today.
- Symbols are the shapes used to create a diagram. For example, in most notations, a diamond represents a decision point.

By notation we mean the set of shapes and drawing conventions, e.g., straight lines or curved ones, that are used to create process diagrams. Shapes are also called symbols. Each notation uses its own shapes and conventions.

The Most Common Symbols

- The most common symbols / shapes used to create process diagrams are those covered in the quality improvement literature.
- These symbols are also included in the International Organization for Standardization (ISO) standard 5807.

Flowchart Symbols⁵



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Now, let's look at the ISO 5807 symbols.

Starting with the top symbol:

The terminal symbol is a rounded rectangle which identifies the beginning or end of a process or origin and destination of data.

The process symbol is a rectangle which designates an activity. Within the rectangle is a brief description of that activity.

The decision symbol is a diamond which designates a decision point from which the process branches into two or more paths. The path taken depends on the answer to the question which appears within the diamond. Each path is labeled to correspond to an answer to the question.

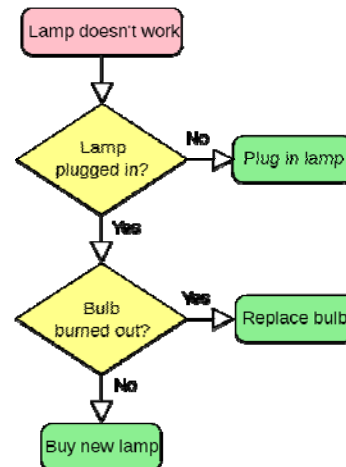
The document symbol is a human readable document pertinent to the process

The flow line represents a process path which connects process elements. The arrowhead indicates the direction of the flow.

The connector is a circle which is used to indicate a continuation of the flow diagram.

Flowchart Example

Examine the flowchart closely. Take a few minutes and list the symbols that are correctly and incorrectly used according to the flowchart symbols on the previous slide.



Example flowchart reprinted from Wikipedia⁶

Correct symbols are used for the decision boxes and the connectors.

Incorrect symbol use is

- 1) a matter of which notation one is following, and
- 2) how formal or conformant to any one notation one wants to be., i.e., correctness with respect to notation is a relative matter.

Comparing the flowchart on this slide to the Juran list of symbols, we see that the rounded-corner rectangle used as a terminator should be a different shape, one with parallel lines on the top and bottom and half-circle curvature on the left and right sides. The arrow heads should be shaded or filled in rather than open.

Example: Patient Intake

A patient arrives at the healthcare setting/clinic and is signed in by the receptionist. The receptionist enters the patient into a visit system as present and confirms the contact and insurance information with the patient. At this point the patient is ready to be seen by the nurse who will conduct the initial examination and interview with the patient. The nurse pulls the chart from the filing stacks and calls the patient to the exam area and escorts the patient to the exam room, interviews the patient regarding symptoms and/or complaints and records into the Nurses/Progress notes, and takes and records vital signs in progress notes. She/he then alerts the Physician that the patient is ready to be seen. Subsequently, the Physician examines the patient and records findings in the progress notes, determines if a prescription, procedure, lab work or a referral is required and completes the necessary paperwork if applicable. The Physician provides any additional instructions to the patient and concludes the visit. Finally, the Physician provides the patient chart to the office staff for refiling and the office staff refiles the patient chart. Also, the patient pays their co-pay and concludes the office visit.

Next we have an example of a defined health care process flow. We will use this scenario to demonstrate representing a process in pictorial form, i.e. in a process flow chart. After the instructions. Pause the slides: Read this scenario and list the process steps. After you restart the slides, we will go over the steps so that you can see how you did. Pause the slides, read the scenario and list the process steps now.

Patient Intake and Clinic Visit

1. Patient arrives at the clinic and signs-in and checks-in with the front desk.
2. Receptionist enters the patient into the visit system as present and confirms the contact and insurance information with the patient.
3. The nurse pulls the chart from the filing stacks and calls the patient to the exam area and escorts the patient to the exam room.
4. The nurse interviews the patient regarding symptoms and/or complaints and records into the Nurses/Progress notes.
5. Nurse takes and records vital signs in progress notes and alerts the Physician that the patient is ready to be seen.
6. The Physician examines the patient and records findings in the progress notes.
7. The Physician determines if a prescription, procedure, lab work or a referral is required and completes the necessary paperwork if applicable.
8. The Physician provides any additional instructions to the patient and concludes the visit.
9. The Physician provides the patient chart to the office staff for refiling.
10. The office staff refiles the patient chart.
11. The patient pays their co-pay and concludes the office visit.

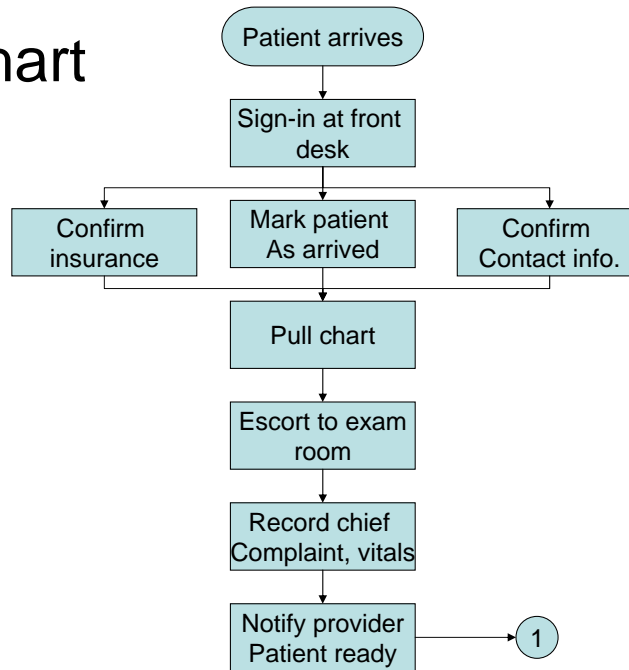


The scenario will first be broken down into discrete steps. The tasks are placed in sequential order.

Pause


Read through these steps and determine if they matched the ones that you listed.

Flowchart



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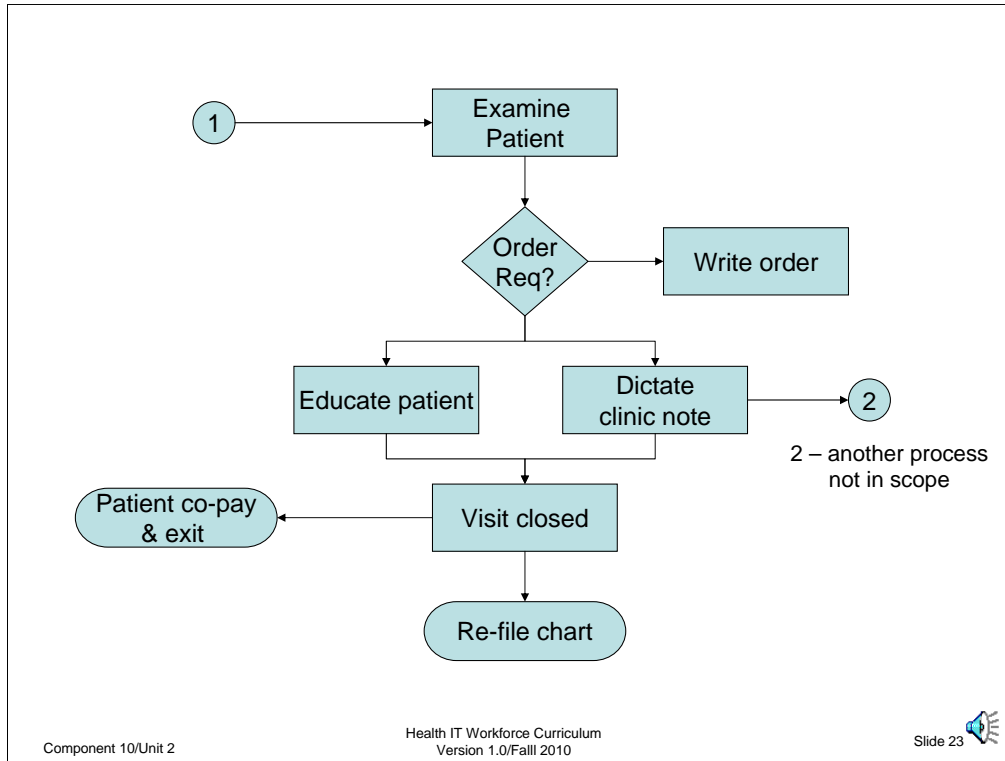
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Pause the slides.

Read the sequence of the slides.

Compare the flowchart to the list of steps. Remember that connector symbol. This flowchart is continued on the next slide.



Read sequence or process steps.

Summary

- In this lecture we have
 - Described the value of process diagrams
 - Given an example list of the process steps from a healthcare scenario
 - Described basic flowchart symbols
- At this point you should be able to
 - List the information generated or used in the process and the sequence of workflow steps when given a workflow process chart consisting of basic flow charting symbols,
 - Read a scenario and using basic flowchart symbols represent the process steps and their sequence

references

1. The American Heritage® Dictionary of the English Language, Fourth Edition copyright ©2000 by Houghton Mifflin Company. Updated in 2009. Published by [Houghton Mifflin](#)
2. *BusinessDictionary.com*, available from <http://www.businessdictionary.com/definition/process-owner.html>, Copyright©2010
3. "flowchart." *Merriam-Webster Online Dictionary*. 2010. Merriam-Webster Online. 23 June 2010
<http://www.merriam-webster.com/dictionary/flowchart>
4. ISO/ANSI 5807 Information processing - Documentation symbols and conventions for data, program and system flowcharts, program network charts and system resources charts. 1985.
5. Juran Joseph M, Gryna Frank M. (eds.) *Juran's Quality Control Handbook*. 1988 McGraw-Hill, Inc. New York.
6. Wikipedia contributors. "Flowchart." *Wikipedia, The Free Encyclopedia*. Wikipedia, The Free Encyclopedia, 22 Jun. 2010. Web. 23 Jun. 2010.
7. Public Health Institute, 2006. *Taking Care of Business: A Collaboration to Define Local Health Department Business Processes*. Decatur, GA: Public Health Informatics Institute. Available online at www.phii.org.

These references are provided for your use throughout this unit.

This concludes the first of two lectures for the Process Mapping unit.

You may go on to the second lecture or stop and return to the second lecture at a later time.