Quality Improvement in Public Health: Models and Methodologies for Practice Based Research Networks

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Overview of Presentation

Objectives

1. Define five elements of Quality Improvement in a Health Department
2. Explain examples of how QI process mapping is applied in Health Departments
3. Identify two approaches to Time Series Analysis and the associated methodological issues
4. Contrast Scientific Method with Science of Improvement
5. Describe three characteristics of Science of Improvement
6. Discuss implications for accreditation and transformative change in health departments

Moving the field forward

We need research that penetrates and elucidates the “black box” of public health agencies and systems

Policy & legal authority

Funding

Human capital

Population needs & risks

Agencies & Systems

Service delivery

Health & economic outcomes

Source: Glen P. Mays, PhD, PHSSR Current State of the Field, 2008

The main question:

How can we penetrate the black box?

What is Quality Improvement?

• Identify waste caused by failures and defects which directly affect quality and cost
• Big QI and small qi
• Top down and bottom up
The next question: How can we improve processes?

What is a Process?

1. Series of steps to produce output (product or service)
2. Almost always cross functional
3. Organization is only as effective as its processes
4. It is repetitive
5. Flow, Pull

Basic Symbols for a Process Map

- Task
- Connects
- Decision
- Beginning
- End

Basic Process Map for Childhood Immunization Clinic

Child arrives at clinic → Register → New patient? → Yes: Give Immunization → Child leaves clinic
No: Need Immunization? → Yes: Register → New patient? → Yes: Give Immunization → Child leaves clinic
No: Child leaves clinic

Inefficiency Definition Example

Disconnect when a handoff from one group to another is managed poorly
Appointment scheduler makes a patient appointment on a day the nurse is not in the clinic.

Bottleneck a point in a process where volume overwhelms capacity
Two patients are scheduled during the same appointment time.

Redundancy an activity repeated at two points in a process
When a patient is asked for insurance information at several different times.

Rework when work is fixed or corrected
If the patient insurance information is entered incorrectly or incompletely, extra work is required to retrieve the information at a later time.

Inspection a point in the process where appraisal occurs

Opportunity Flowchart for Childhood Immunization Clinic

Process Features: Four Distinctions
- Core process and support process
- The cross functional nature of core process
- Process lead time
- Process and system

Value Stream Mapping
- Process map that examines flow throughout a health department.
- The goal is to increase flow in a process.

Flowchart Symbols for Value Stream Mapping
- Process Box
- Supporting Departments
- Database
- Persons Waiting
- Improvement
Flowchart Symbols for Value Stream Mapping

- **Process Box**: The process box shows the steps in the process with additional information regarding time and number of persons involved in the specific steps.
- **Supporting departments**: Departments that support a process are depicted by a house-shaped box. These departments can include the laboratory, cardiology, medical records, and so forth.
- **Cylinder**: The cylinder represents a database. A VSM usually shows the flow of a client (or tasks) as well as flow of information.
- **Arrow**: An arrow shows the direction of flow in a process.
- **Information**: Information is an important component of a value stream map and in relation to process flow.
- **Triangle**: The triangle depicts the number of clients (or potential number of clients) waiting at each step in the process.
- **Explosion**: The explosion symbol represents an area in the process targeted for improvement.

Current State Value Map

- A current state map focuses on one service from beginning to end.
- If the intent is to map the flow for a childhood immunization clinic, it is not necessary to map the entire WIC program.
- Mapping other health department processes would make the current state map too complicated to analyze the process of interest.
Current State
Value Stream
Map for Childhood
Immunization
Clinic

Process Efficiency Percentage = \frac{\text{Value Added Time}}{\text{Total Time}} \times 100\% = \frac{16 \text{ minutes}}{33 \text{ minutes}} = 33\%

Future State
Value Stream
Map for Childhood
Immunization
Clinic

The Six Wastes

<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Definition</th>
<th>Example</th>
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<tbody>
<tr>
<td>Delay</td>
<td>Waiting</td>
<td>Client waits in waiting room</td>
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<tr>
<td>Over Processing</td>
<td>Too much paperwork</td>
<td>Client registers multiple times</td>
</tr>
<tr>
<td>Transportation</td>
<td>Moving people, supplies</td>
<td>Client travels to separate site</td>
</tr>
<tr>
<td>Motion</td>
<td>Excess movement of staff</td>
<td>Searching for chart and immunization</td>
</tr>
<tr>
<td>Inventory</td>
<td>Excess supplies</td>
<td>Vaccine is overstocked and becomes outdated</td>
</tr>
<tr>
<td>Defects</td>
<td>Errors and mistakes</td>
<td>Childhood immunization shots not given</td>
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Exploring the Black Box:
Quality Improvement Opportunities in Public Health

- Understand the Value Stream
- Understand the Process Capability
- Understanding flow
STD Rates: Static Comparison

- Year 1: 5
- Year 2: 4.5

Monthly STD Rate: Run Chart
- Median STD Rate: 4.2%
- Trend Line

Time Series Analysis
- Regression Analysis
  - Beta Coefficient
  - Explained Variance
  - Multiple Determinants
- Control Chart Analysis
  - Process Performance (Stability and Capability)
  - Special Cause, Common Cause
  - Early Detection
27 Statistical Process Control and Regression Analysis

<table>
<thead>
<tr>
<th></th>
<th>Control Chart</th>
<th>Regression Analysis</th>
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</thead>
<tbody>
<tr>
<td>Statistical Principles</td>
<td>Create control limits</td>
<td>Y-Intercept</td>
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<tr>
<td></td>
<td>Detect special cause</td>
<td>Slope</td>
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<tr>
<td></td>
<td>Identify common cause</td>
<td>Best Fit</td>
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<td>Probability</td>
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<td>0.05</td>
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<td>1.97 standard deviations</td>
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<td>Features</td>
<td>Process stability</td>
<td>Prediction</td>
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<td>Process capability</td>
<td>Explained variance</td>
</tr>
<tr>
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<td>Process shift</td>
<td>Strength of relationship</td>
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28 Summary

- Understanding process performance is an importance first step to penetrating the black box to ensure public health services are delivered efficiently and effectively.
- Techniques to analyze processes:
  - Process Map
  - Opportunity Map
  - Value Stream Map
  - Spaghetti Diagram
  - Value added vs. Time Chart
29  Value Added vs. Time

30  Science of Discovery

31  Science of Improvement

- Randomized Control Trial (RCT)
- Classic Experimental Model
- $O \times O$ Treatment Group
- $O \times O$ Control Group

- Most public health (and health care) interventions occur in complex, multi-component settings
- Improvement is a process of social change (Berwick, “Science of Improvement,” JAMA, 2008)
- CMO Model
  
  Context + Methods = Outcome
  
  (Paulsen & Tilley, Realistic Evaluation, 1997)
What is Transformational Change?

- A shift in the way work is viewed and the approaches to improve performance.
- Combine Big QI and small qi to create a new way of looking at the PH process to transform the way value is delivered to the community and client.
- Professional Knowledge and Process Knowledge

Voluntary Accreditation Goal

The goal of a voluntary national accreditation program is to improve and protect the health of the public by advancing the quality and performance of state and local public health departments.

60% of population served by an accredited health department by 2015

Exploring Accreditation Final Report, p. 4

The 11 Domains

1. Conduct assessment activities focused on population health status and health issues facing the community
2. Investigate health problems and environmental public health hazards to protect the community
3. Inform and educate about public health issues and functions
4. Engage with the community to identify and solve health problems
5. Develop public health policies and plans
6. Enforce public health laws and regulations
7. Promote strategies to improve access to healthcare services
8. Maintain a competent public health workforce
9. Evaluate and continuously improve processes, programs, and interventions
10. Contribute to and apply the evidence base of public health
11. Administrative Capacity & Governance

Thank You!