Six Easy Steps on How to Create a Lean Sigma Value Stream Map for a Multidisciplinary Clinical Operation

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Value stream mapping (VSM) is a very useful technique to visualize and quantify the complex workflows often seen in clinical environments. VSM brings together multidisciplinary teams to identify parts of processes, collect data, and develop interventional ideas. An example involving pediatric MRI with general anesthesia VSM is outlined. As the process progresses, the map shows a large delay between the fax referral and the date of the scheduled and registered appointment. Ideas for improved efficiency and metrics were identified to measure improvement within a 6-month period, and an intervention package was developed for the department.

Key Words: Value stream map, clinical operations, pediatric MRI general anesthesia, practice quality improvement

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INTRODUCTION

Value stream mapping (VSM) is a proven technique to build a common team perspective of a workflow process, identify potential "quick-hit" improvements, understand the product/process relationships, and combine product and technical information flows. In the field of radiology, one may work within many different processes, such as patient flow, order flow, and image request flow. VSM was developed as a "lean production management system" technique; however, it is also a useful tool in many quality projects/initiatives.

VSM improves upon traditional process map or flow diagrams because this methodology enables the capture of both processes and material flows and in doing so, allows for the clear identification of the value-added steps and non—value-added *muda*, also known as waste. VSM brings together multidisciplinary teams to understand each detail of the process to avoid common project pitfalls, such as the team falsely assuming they are familiar with the process, or failing to see the true current state without observing the process in the *gemba*, also known as the workplace. This article provides instruction on how to construct a value stream map. Additionally, examples encompassing VSM techniques are included that are specific to its use in the highly complex workflow of a radiology department tracking pediatric MR cases involving general anesthesia [1].

Before attempting to build a value stream map, it is important to start an improvement project by gaining a clear understanding of your customer's needs and expectations in relation to the product group to be mapped. VSM has 6 general steps:

1. Create a "suppliers, inputs, processes, outputs, and customers" (SIPOC) chart to place customers and suppliers on the value stream map (end and beginning of process).
2. Go to the *gemba* (workplace) and observe the process.
3. Map the material (process) flow. The process should capture minimally 4-8 general steps. Be sure to identify queues and/or staging areas in the process.
4. Identify the information systems used, and map the flow.
5. Identify data and time stamps (lag time, number of people, delays, etc.) to be captured and collected. Track time required for each process and the reason it requires that amount of time. When analyzing the map, look for *muda* (waste) of all forms—information waste, process waste, waste in the physical environmental, and potentially, people waste.
6. Complete and validate the map and baseline data of the current process.

Upon completion of the current VSM process, the next step is to begin critiquing the current process to determine the root cause(s) of the problem. Encourage the team to make suggestions for improvement, remove

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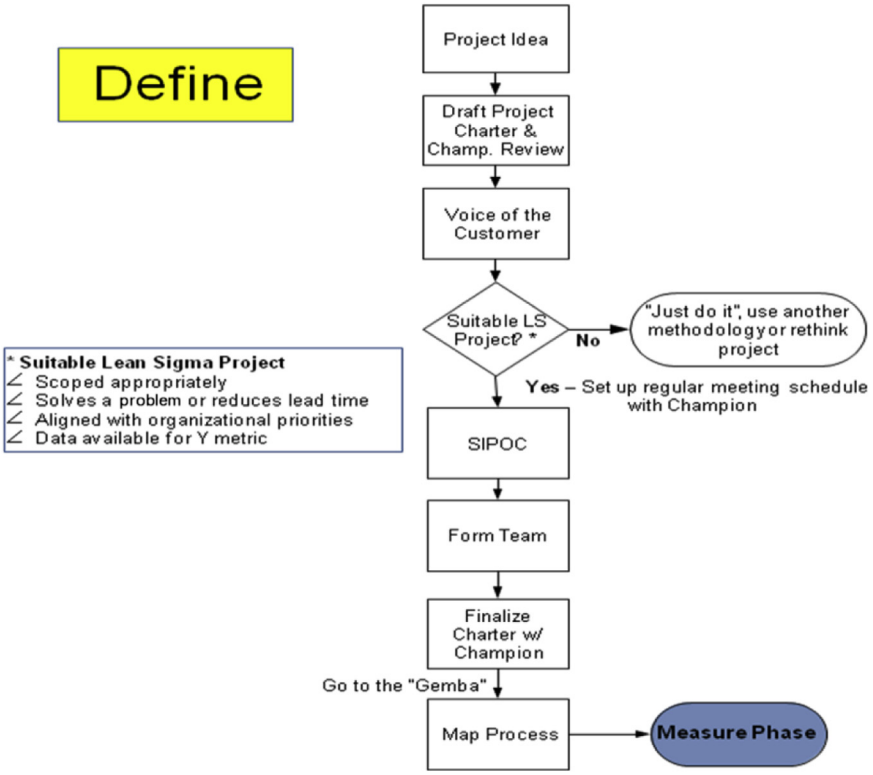

Fig 1. Example baseline value stream map. Champ = champion, LS = lean sigma.

the waste, and implement necessary interventions accordingly. After identifying changes, map the interventions into the future state of the process. This new map will track the piloting stage of the improvement process. After collecting sufficient data, check to ensure that the benefits expected have been obtained, analyze the benefits, and if improved, implement the new process.

VSM: AN EXAMPLE

A multidisciplinary team was strategically assembled to enhance the pediatric MRI general anesthesia scheduling

S	I	P	O	C
Supplier	**Inputs**	**Process**	**Output**	**Customer**
Scheduling Nurses	MRI Safety Information	Referring Physician Faxes Referral	PACU information	Pediatric Parents
Anesthesia	Anesthesia Information		Further testing / scans	PACU
Radiologists	Information Systems (ORMIS, EPIC, RIS)		Admitting Information	Receiving Unit
Patient	Schedule		MRI Scan Results	Primary Care Physicians
Referring Physicians	Available Scan Time			Radiologists
MRI Scanner	MRI Order	Nurse Screening		Pediatric Patients
Radiology Nurses	H&P			
Radiology Techs	Child Life Consultation			
Mollie Child Life Specialist	Patient Information			
Prep & PACU				
Registration		Radiologist Protocol		
Rad Nurse Holding Area				
Primary Care Physicians				
Scheduler				
		Nurse Review		
		Patient Scheduled		
		Patient Registers In-House for Scan		

Fig 2. Pediatric MRI with general anesthesia scheduling workflow SIPOC. H&P = history and physical; ORMIS = operating room management information system; PACU = pediatric acute-care unit; prep = preparation; rad = radiology; RIS = radiology information system.