

# 1 Problem

<b>What</b>	Problem(s)	Each year nearly 32 million surgeries are performed without a proper supply of oxygen and anesthesia
<b>When</b>	Date	Ongoing
	Different, unusual, unique	Issues with electricity, difficult to procure enough oxygen tanks
<b>Where</b>	Facility, site	Hospitals in developing nations
	Unit, area, equipment	Anesthesia equipment
	Task being performed	Surgery
<b>Impact to the Goals</b>	<b>Patient Safety</b>	Inadequate anesthesia provided during surgery
		Unable to have recommended surgery
	<b>Patient Services</b>	Hospital unable to perform recommended surgery
	<b>Schedule/ Operations</b>	Surgery delayed or canceled

# A SOLUTION FOR SAFE ANESTHESIA

Cause Map

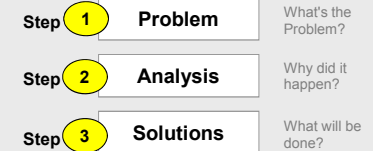
## A new machine is designed to provide anesthesia safely without oxygen tanks or stable electricity

Almost 32 million surgeries are performed globally each year without a proper supply of oxygen and anesthesia, predominantly in developing nations. Many more surgeries are canceled or delayed because anesthesia isn't available. One of the issues that plague hospitals in low income countries is that traditional anesthesia machines need electricity and oxygen tanks to function, both of which can be in short supply. A new design, called the Universal Anesthesia Machine (UAM), can operate without electricity or oxygen if necessary and is proving to be a practical solution to this difficult problem.

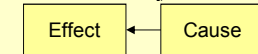
Cause Mapping is a Root Cause Analysis method that captures basic cause-and-effect relationships supported with evidence.

### CAUSE MAPPING

Problem Solving • Incident Investigation • Root Cause Analysis



### Why?

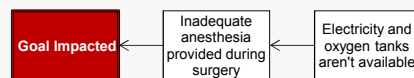


NOTE: Read the Cause Map from left to right with the phrase "Was Caused By" in place of each arrow.

# 2 Analysis

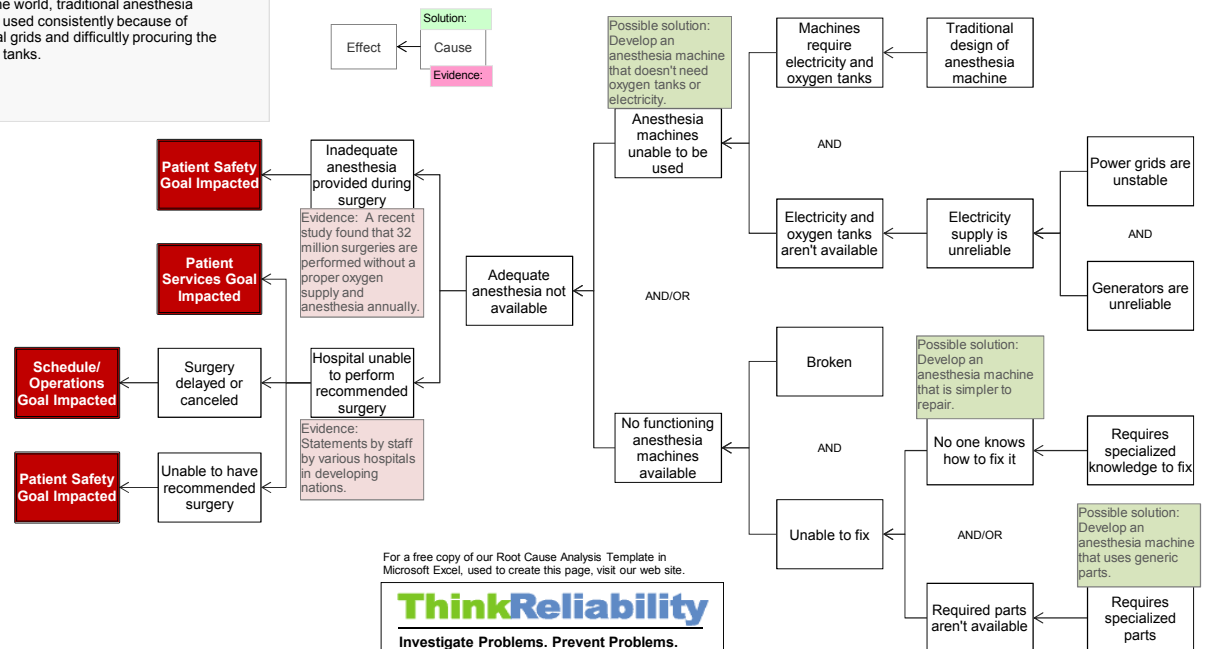
**Basic Level Cause Map** - Start with simple Why questions.

**Basic Cause-and-Effect**



In many parts of the world, traditional anesthesia machines can't be used consistently because of unreliable electrical grids and difficulty procuring the necessary oxygen tanks.

**More Detailed Cause Map** - Add detail as information becomes available.



For a free copy of our Root Cause Analysis Template in Microsoft Excel, used to create this page, visit our web site.

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# 3 Solutions

The UAM was invented by a doctor, Dr. Paul Fenton, who worked as an anesthesiologist at Queen Elizabeth Central Hospital in Blantyre, Malawi where he saw the problems with providing adequate anesthesia first hand. He designed his machine to use electricity when it is available, but to continue to function if power is lost by using a hand-powered pump on top. A digital display of oxygen levels switches to a 10 hour battery when power is lost so that the patient can continue to be monitored. It also uses a compressor and air from the room so oxygen tanks aren't required.

In an effort to make the UAM as practical to use as possible, it doesn't use specialized parts. Parts needed to maintain the machine should be available through a typical auto supply shop. It's also a flexible design that is compatible with all standard adult and pediatric breathing systems.