



**Department
of Health**



HRSA Ryan White HIV/AIDS Program

**CENTER FOR QUALITY
IMPROVEMENT & INNOVATION**

Essential Tools for Improvement: A Practical Overview of Basic Tools for Quality Improvement (Part 1)

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**Department
of Health**

Center for Quality Improvement & Innovation

- Funded by the HRSA HIV/AIDS Bureau [#U28HA53134].
- Managed by the New York State Department of Health AIDS Institute.
- “Together, we continue to improve the lives of people with HIV across the United States. CQII provides state-of-the-art technical assistance and training to Ryan White HIV/AIDS Program (RWHAP)-funded recipients and subrecipients that measurably strengthen local clinical quality management programs and improve patient care, health outcomes, and patient satisfaction.”



Learning Objectives

By the end of this session (part one of two), participants will be able to:

1. List four of the seven basic quality tools that should be in every quality improver's toolbox.
2. Describe the purpose and typical use for each of the tools.
3. Analyze concrete examples of how each tool supports improvements in HIV linkage to care, retention to care, and/or viral suppression.
4. Develop a plan for applying one of the seven tools within their own organizational setting.

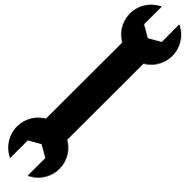
The Seven Tools

Part one:

1. Run Chart & Control Charts
2. Cause and Effect Diagram
3. Check Sheet
4. Pareto Chart

Part two:

5. Scatter Diagram
6. Histogram
7. Stratification/Flowchart

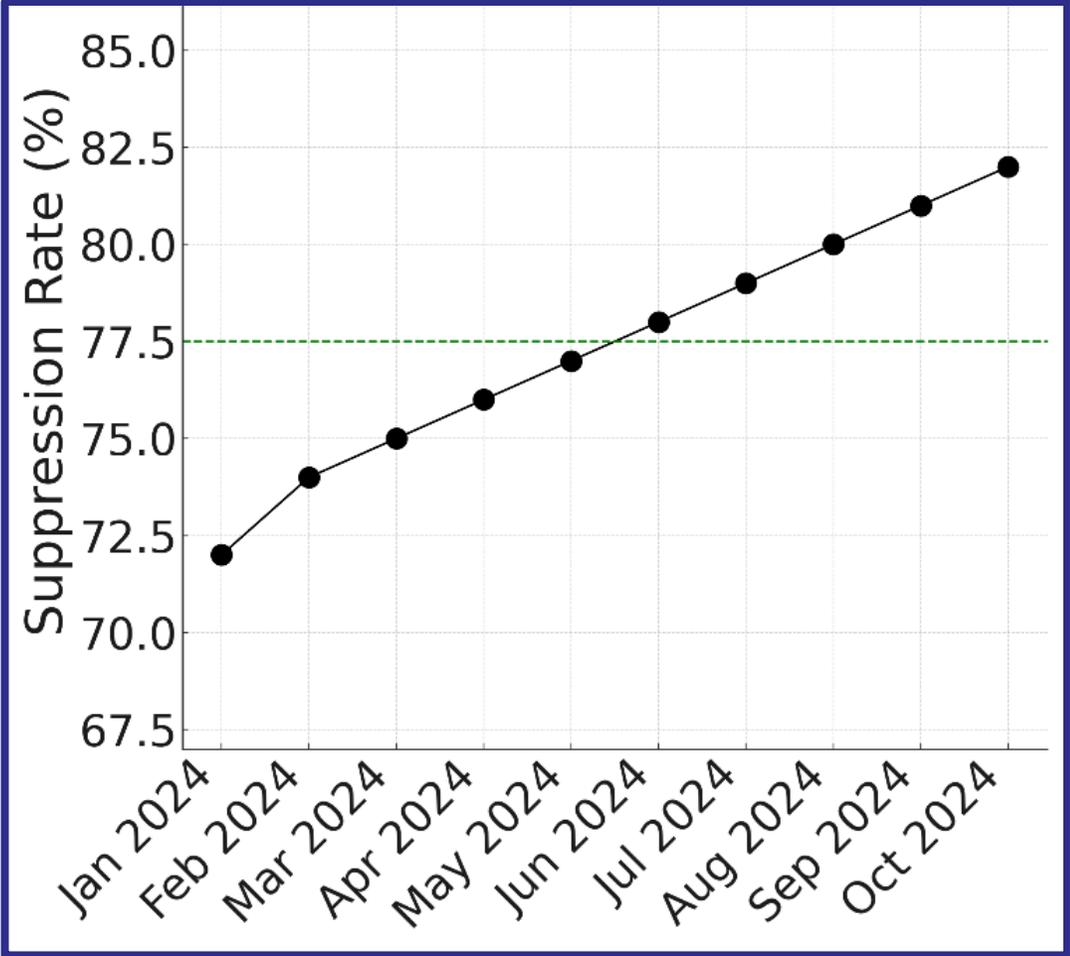


Tool 1

RUN CHARTS AND CONTROL CHARTS

Run Charts & Control Charts

- **Purpose:** Monitor data over time and identify variation.
- **When to Use:** When tracking performance, learning about performance.
- **Visual:** Line chart. Control charts also plot data average and control limit lines. Run charts plot median line.

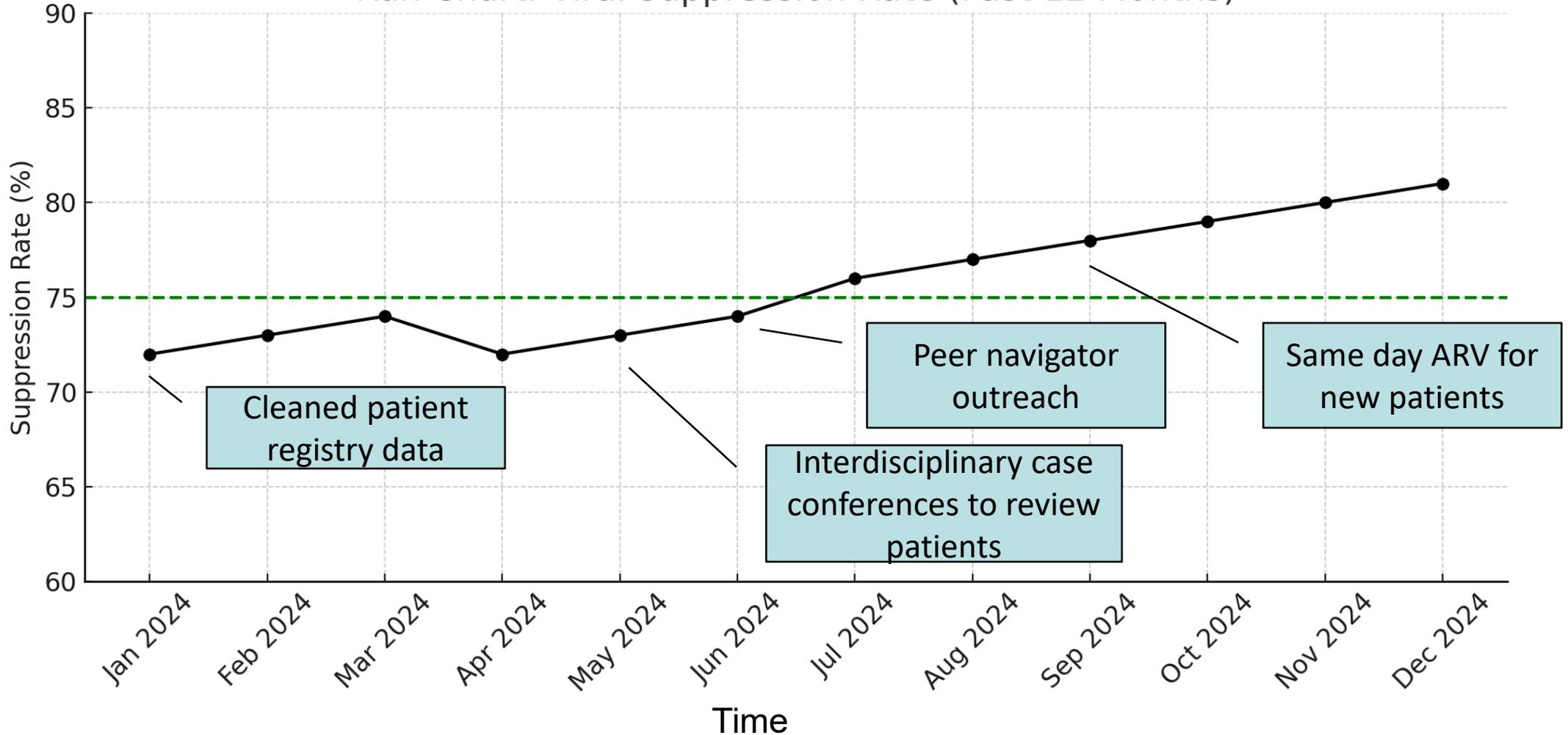


Run Chart & Control Chart Comparison Chart

Aspect	Run Chart	Control Chart	Shared Features
Construction	<ul style="list-style-type: none"> Plots data over time Uses a median (middle value) line No control limits 	<ul style="list-style-type: none"> Plots data over time Uses a mean (average) line Includes upper control limits (UCL) and lower control limits (LCL) 	<ul style="list-style-type: none"> Line chart with time on x-axis, data/observation on y-axis Tracks process performance over time
Purpose	<ul style="list-style-type: none"> Learn about the effects of changes where improvement is expected 	<ul style="list-style-type: none"> Identify special and common cause variation in systems Detects process stability 	<ul style="list-style-type: none"> Used to evaluate if changes are leading to improvement
When to Use	<ul style="list-style-type: none"> Early in improvement projects 	<ul style="list-style-type: none"> After baseline is established 	<ul style="list-style-type: none"> Tracking change over time, learning about effects of changes
Analysis	<ul style="list-style-type: none"> Run chart rules to identify patterns in the data (e.g., 6+ points above/below median) 	<ul style="list-style-type: none"> Control chart rules to identify patterns in the data (e.g., points outside control limits) 	<ul style="list-style-type: none"> Interpret data based on rules-based observable patterns
Skill Level	<ul style="list-style-type: none"> May be simpler to create and interpret 	<ul style="list-style-type: none"> Requires additional statistical and spreadsheet knowledge 	<ul style="list-style-type: none"> Usable by teams with QI training

Run Chart: Viral Suppression Rate (Past 12 Months)

Run Chart: Viral Suppression Rate (Past 12 Months)



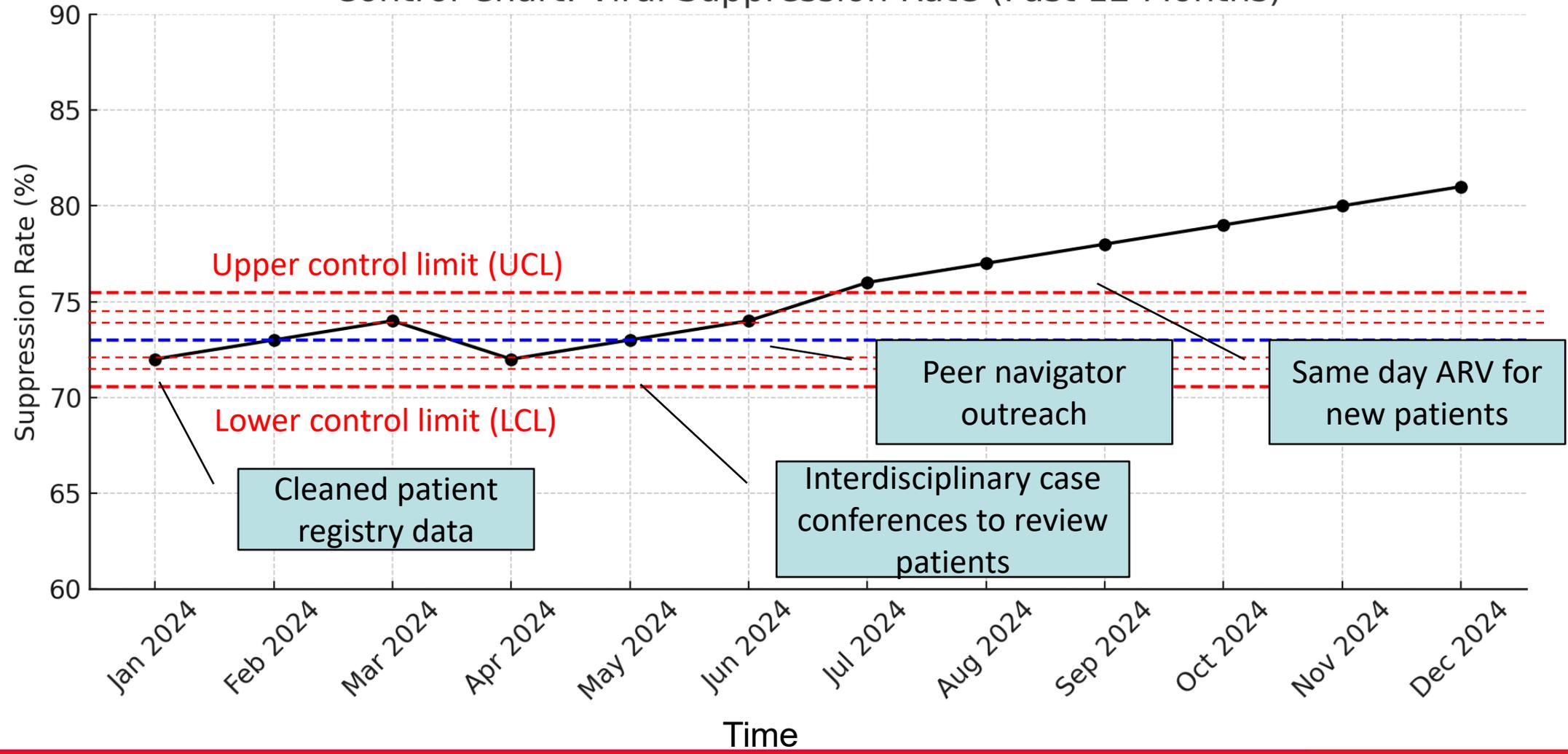
Run Chart Rules

Rule	Criteria
Rule 1: Shift	6 or more consecutive points <i>either</i> all above or all below the median.
Rule 2: Trend	Five (5) or more consecutive points all going up or down.
Rule 3: Runs	Too few or too many runs crossing the median (see table of critical values in reference).
Rule 4: Astronomical point	Used to detect an unusually large or small number. This rule is not probability based, though may be useful for learning.

Perla, Rocco, Lloyd P. Provost, and Sandy Murray. "The Run Chart: A Simple Analytical Tool for Learning from Variation in Healthcare Processes | BMJ Quality & Safety." *BMJ Quality & Safety* 20 (2011): 46–51.

Control Chart: Viral Suppression Rate (Past 12 Months)

Control Chart: Viral Suppression Rate (Past 12 Months)



Constructing Control Charts

1. Select the right control chart:

- Use a chart selector or software to choose the right control chart.

2. Construct the control chart (use software or macro).

- Calculate and plot the average (or mean or center line).
- Calculate and plot control limits at ± 1 , ± 2 , and ± 3 standard deviations (SD) from the mean.

3. Interpret the control chart:

- Use control chart rules to identify “out-of-control” signals.
- Seek to understand the type of variation and its source for learning.

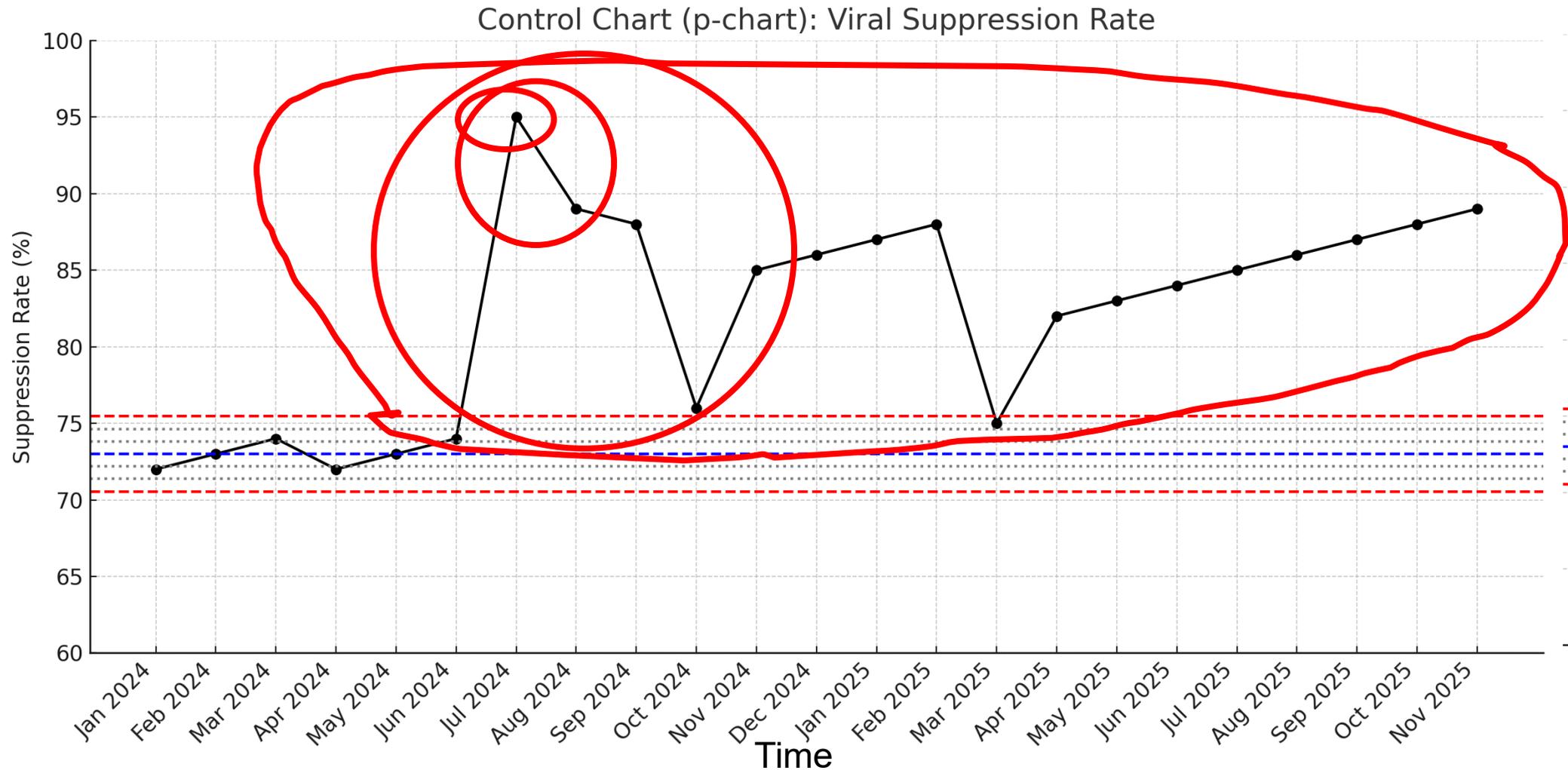
https://asq.org/quality-resources/control-chart?srsId=AfmBOoprNgkKK0UaXXqZp0Y_R6SYfWn8DYTwRFmMv1TBi1Tesp6_Ft_#Use

American Society for Quality (ASQ) Control Chart Rules

Rule	Out-of-control signals
1	A single point outside the control limits (above the UCL or below LCL).
2	Two out of three successive points are on the same side of the centerline and farther than 2 standard deviations (SD) from it.
3	Four out of five successive points are on the same side of the centerline and farther than 1 SD from it.
4	A run of eight in a row are on the same side of the centerline. Or 10 out of 11, 12 out of 14, or 16 out of 20.
5	Obvious consistent or persistent patterns that suggest something unusual about your data and your process.

[#Procedure](https://asq.org/quality-resources/control-chart?srsltid=AfmBOoprNgkKK0UaXXqZp0Y_R6SYfWn8DYTwRFmMv1TBi1Tesp6_Ft)

"Out of Control" Signal Seek and Find



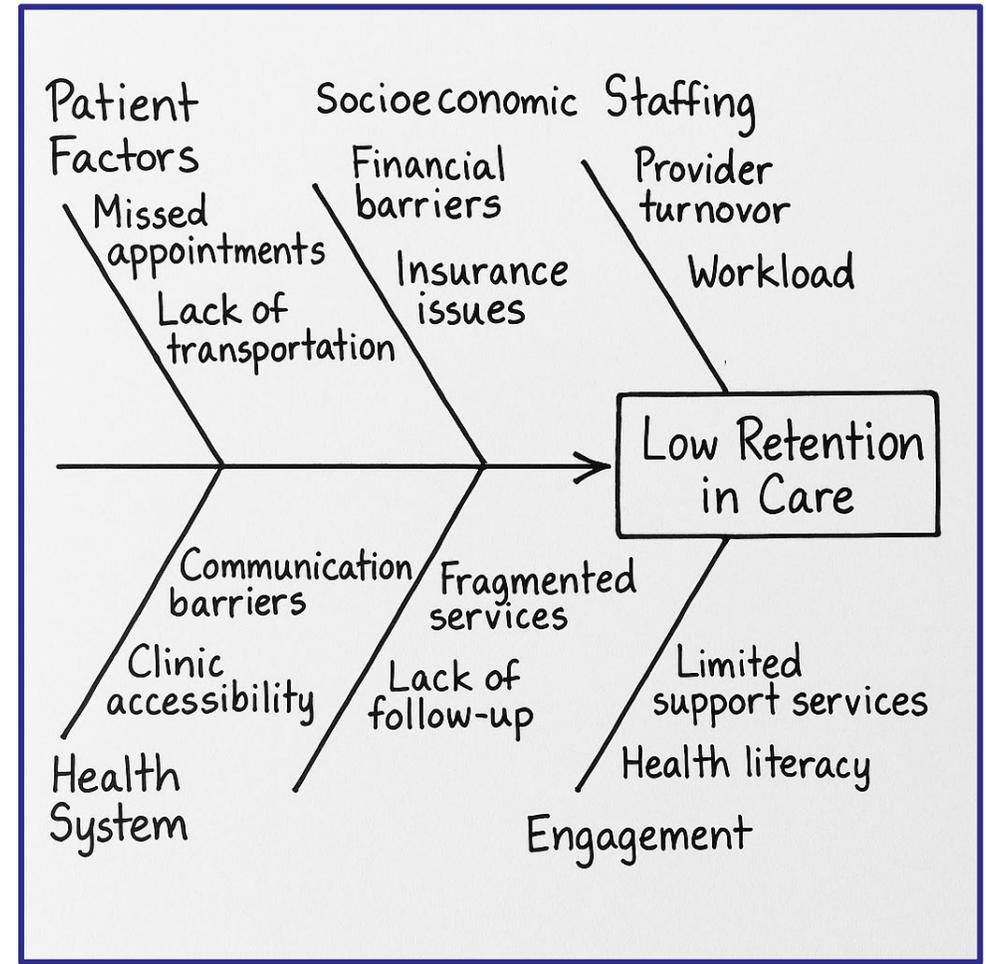


Tool 2

CAUSE-AND-EFFECT DIAGRAM

2. Cause-and-Effect Diagram

- **Also called** Fishbone diagram and Ishikawa diagram
- **Purpose:** Identify the root causes of a problem
- **When to Use:** When exploring potential causes of poor outcomes
- **Visual:** Fishbone diagram with branches like 'Patient factors', 'System issues', etc.



Problems to Explore

30% of registered patients haven't been seen in our clinic in the past 6 months.

20% of patients aren't reaching viral suppression within six months of ART start.

No patients are involved in our improvement work.

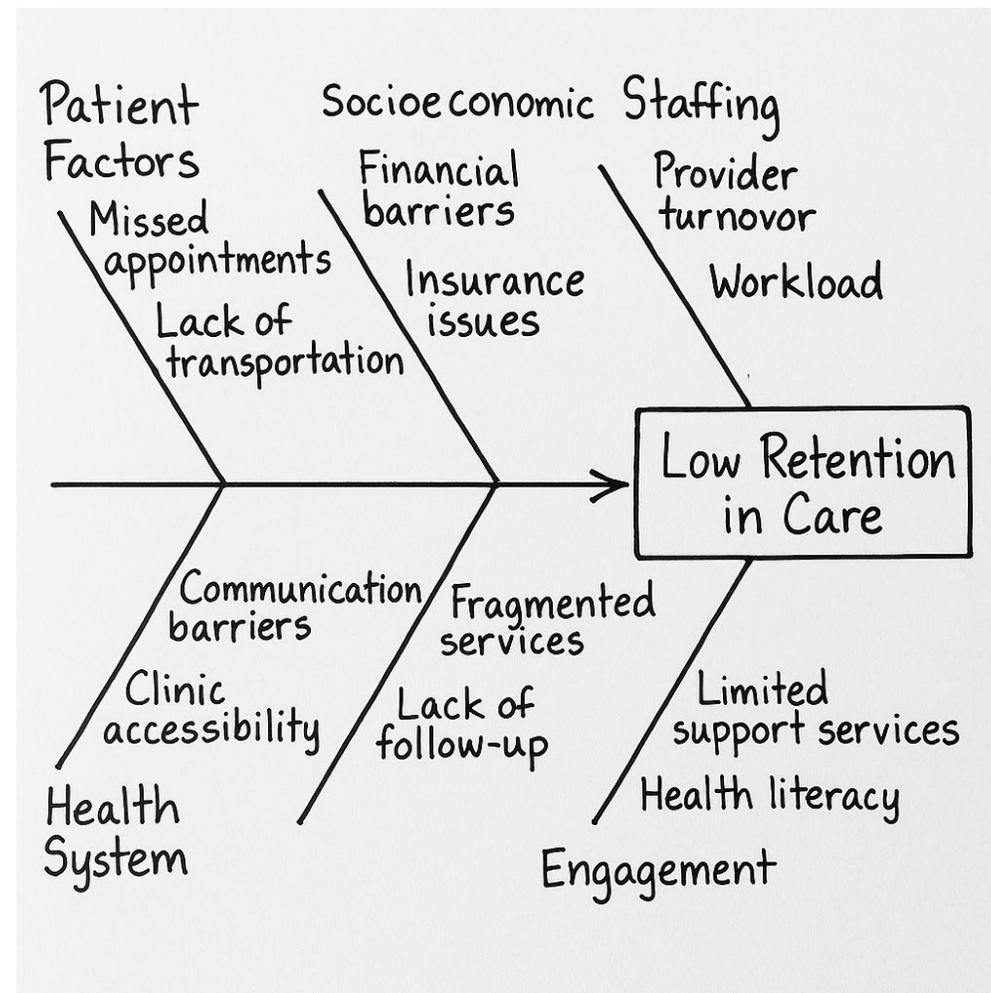
Clients diagnosed in community settings experience longer linkage-to-care times compared to those diagnosed within our clinical system.

Only 65% of patients newly diagnosed with HIV are linked to care within 30 days.

We don't have data to support our improvement efforts.

Cause-and-Effect Diagram (Fishbone Diagram)

- A tool that engages a *team* in brainstorming to identify, explore, and visually display root causes that are connected to a problem.
- The root causes that are identified can be validated, tested for frequency, and used to identify change ideas to tackle the problem.



Constructing the Cause-and-Effect Diagram

- 1. Define the problem clearly:**
 - Write a short, specific statement. What exactly are we trying to understand?
- 2. Gather consensus for the problem statement:**
 - Ask colleagues, leaders, and clients: “Do we all agree this is the right problem to focus on?”
- 3. Label key cause categories:**
 - Common cause categories include People | Processes | Environment | Policies | Systems | Communication.
- 4. Brainstorm contributing causes:**
 - With your team: Ask “Why does this happen?” and keep going deeper.
- 5. Use sticky notes or a whiteboard (or virtual whiteboard) to place causes:**
 - Consider where processes might be breaking down.



Tool 3

CHECK SHEET

3. Check Sheet

- **Purpose:** Collect and organize data in real time.
- **When to Use:** To find patterns in events or behaviors (in real time and/or retrospectively).
- **Visual:** Table tallying frequency of observed categories (e.g., transportation issues, work conflict, etc.).

CHECK SHEET

REASON FOR MISSED APPOINTMENT	COUNT
Transportation issue	
Work conflict	
Forgot	
Illness	
Other	3

Example: Check Sheet to Retrospectively Identify Defects in a Process

Linkage > 30 days retrospective case audit of 30 random charts	Frequency
Incomplete or missed referral	
Delayed referral (list reasons if known below)	
Delay due to scheduling backlog	
Missed internal referral from testing to care team	
Insurer/payer issues	
Community partner delayed notification	
Missing or incomplete contact information from community referral	
Client unreachable after 3+ attempts	
Housing instability	
Patient not aware of diagnosis	
Patient experiencing mental health crisis	
Patient experiencing substance use issues	
Patient not available other reasons	
Other (not listed above): _____	

Example: Check Sheet to Prospectively Observe Process Completion



Plan: Observe the linkage process at Care Clinic for five (5) newly diagnosed patients.
Record parts of the process not completed for further learning and investigation.

LINKAGE STEP	Pt1	Pt2	Pt3	Pt4	Pt5	Total
Emotional support offered at diagnosis						
Teach-back on next steps performed						
Warm hand-off to clinic team						
Provider available for same-day visit						
Clinic capacity for same-day appointment						
Patient available for same-day appointment						
If patient declined, reason documented						
HIV clinic appointment scheduled within 7 days						

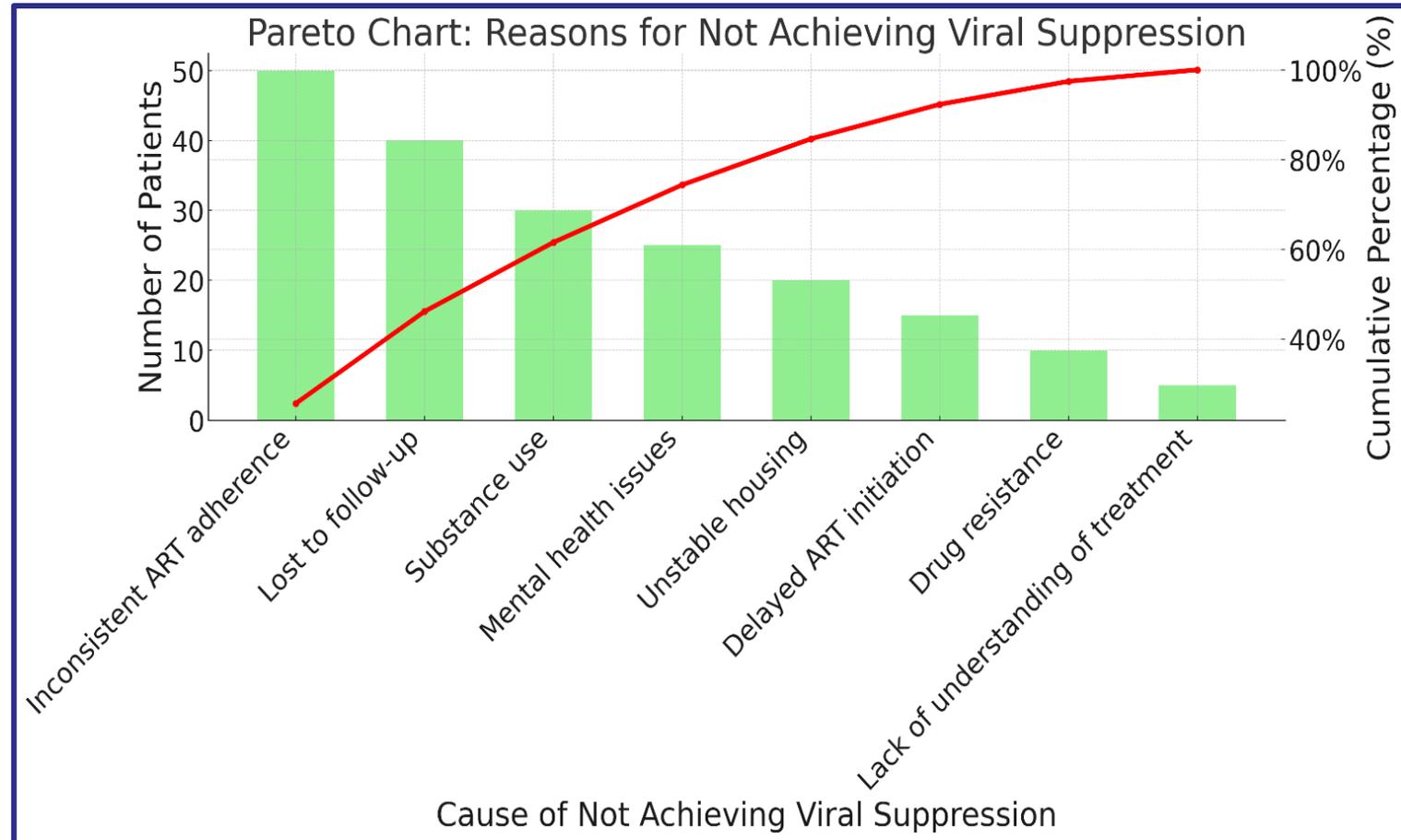


Tool 4

PARETO CHART

4. Pareto Charts

- **Purpose:** Identify the most significant contributors to a problem (the “vital few”)
- **When to Use:** When prioritizing issues for action
- **Visual:** combines bar and line graphs: bars show counts in order of frequency; the line shows cumulative impact.



Creating a Pareto Chart with Excel

1. Gather data

- Start with a check sheet table with frequency counts
- Data should be categorical and countable (e.g., number of times referral missed)

2. Enter data in Excel

- Column A: Categories & Column B: Frequencies

3. Sort data

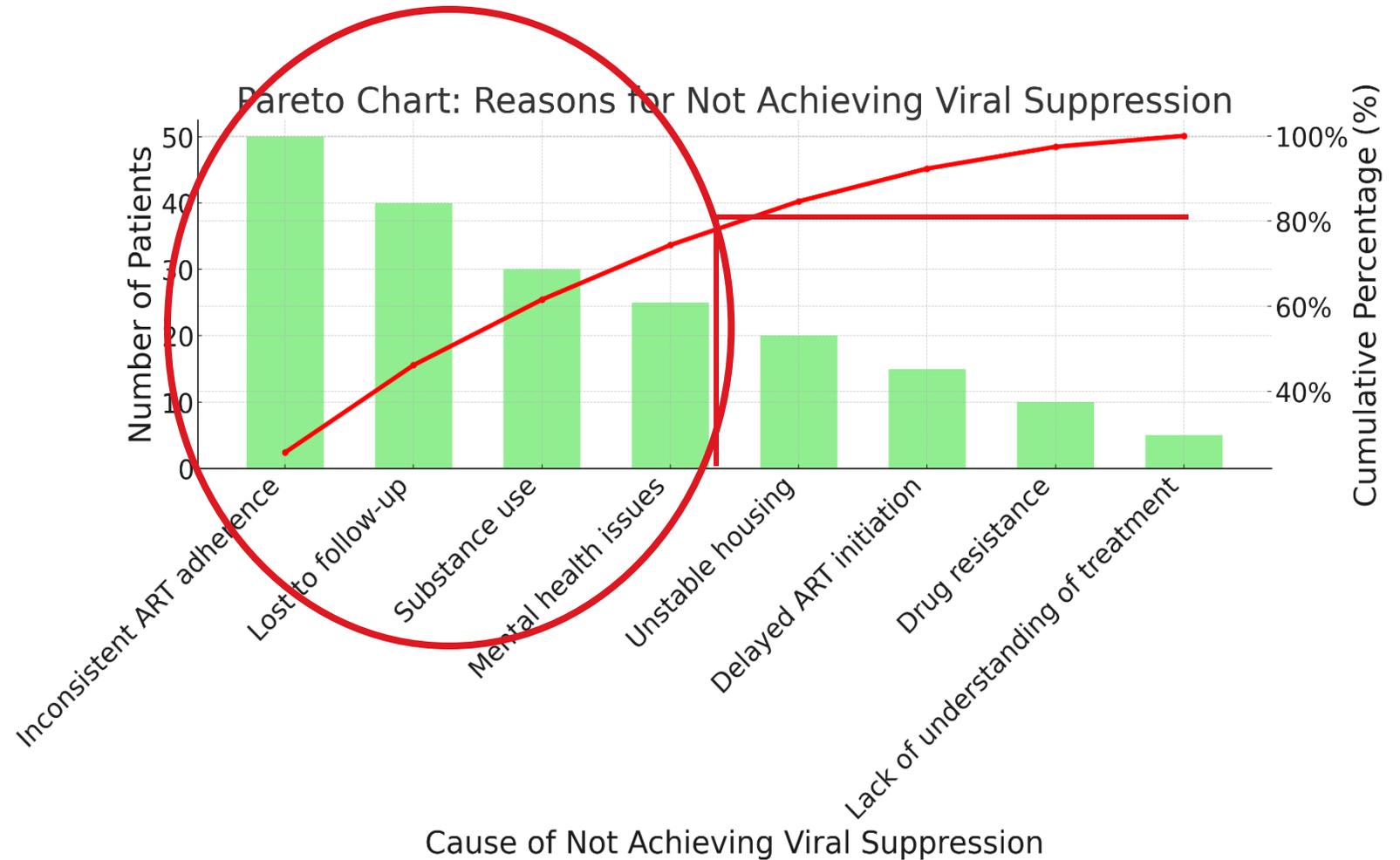
- Highest to lowest frequency

4. Select “Insert chart”

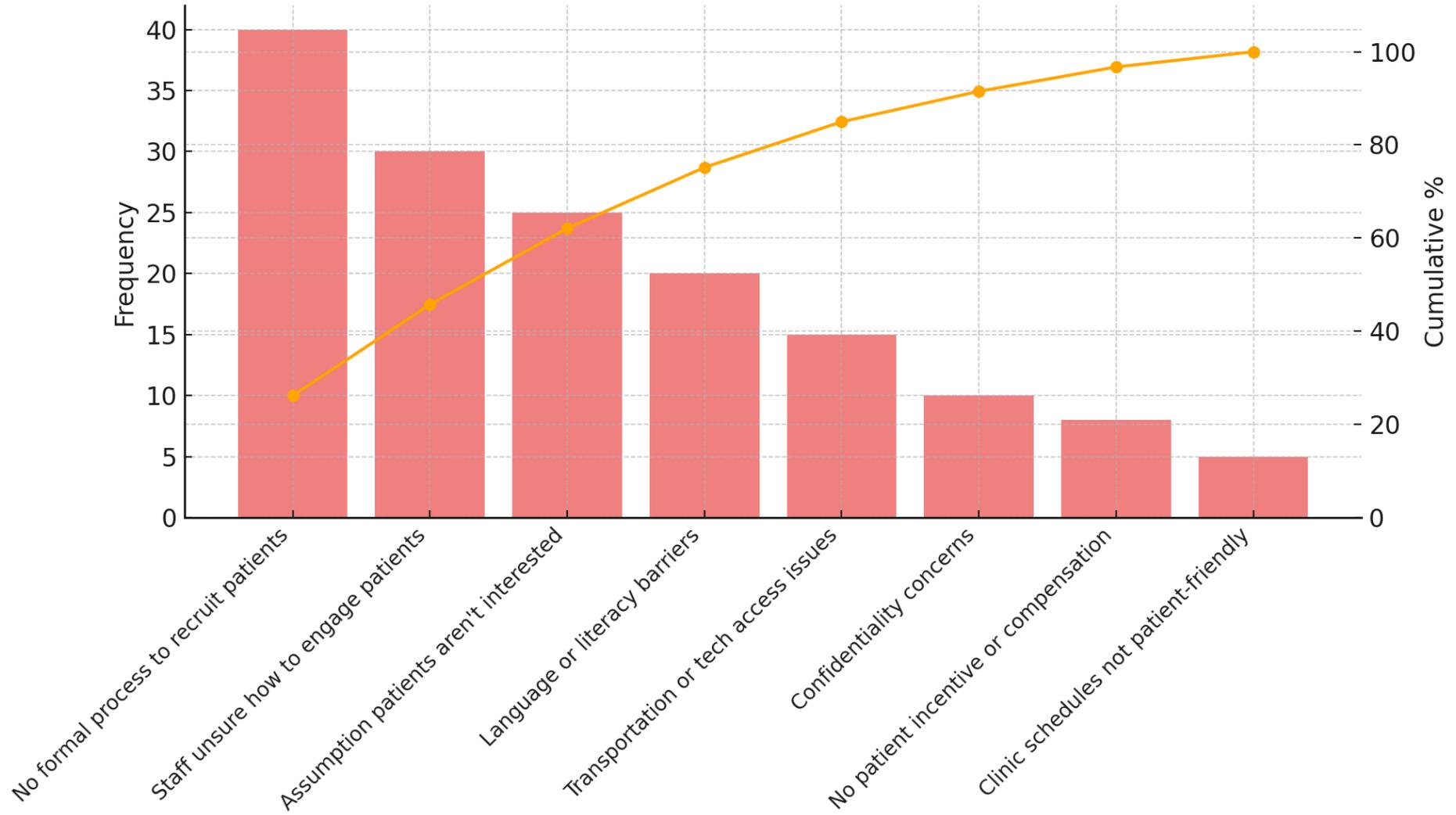
- Select data → Insert → Statistic Chart → Pareto

80/20 Rule in Action

- A Pareto chart shows that **roughly 80% of problems come from 20% of causes**—helping you focus on the biggest impact areas for improvement.



Pareto Chart: Reasons No Patients Involved in QI Work



Discussion

What questions do you have?

Tools Covered

Tool	Application
Run charts and control charts	Purpose: Monitor data over time and identify variation When to Use: When tracking performance, learning about performance
Cause and effect chart	Purpose: Identify the root causes of a problem When to Use: When exploring potential causes of poor outcomes
Check sheet	Purpose: Collect and organize data in real time When to Use: To find patterns in events or behaviors (in real time and/or retrospectively)
Pareto Chart	Purpose: Identify the most significant contributors to a problem (the “vital few”) When to Use: When prioritizing issues for action

Discussion

Which tool are you most curious about trying this week—and what small data set could you use to test it out?

Poll questions

1. Which of these tools is BEST for identifying the most frequent causes of a problem?

- A. Run Chart
- B. Fishbone Diagram
- C. Pareto Chart
- D. Control Chart

- Explanation: The Pareto Chart highlights the "vital few" causes contributing most to a problem.

2. What's the main difference between a run chart and a control chart?

- A. Control charts include control limits; run charts do not
- B. Run charts use more colors
- C. Run charts require more data
- D. There is no difference

- Explanation: Control charts show variation over time **with control limits** to distinguish between common and special cause variation.

Poll questions

3. What is a fishbone diagram most useful for?

- A. Tracking trends over time
- B. Visualizing root causes of a problem
- C. Sorting data by size
- D. Comparing two metrics

- *Explanation: The fishbone (Ishikawa) diagram helps teams brainstorm and categorize potential root causes of a problem.*

4. In a Pareto Chart, what does the vertical bar height represent?

- A. Time
- B. Percent change
- C. Frequency or count of occurrences
- D. Probability

- *Explanation: The bars show how often each category contributes to the overall issue.*

Tools Coming in Part Two

Tool	Application
Stratification / Flowchart	Purpose: Organize data or process steps by subgroup or sequence. When to Use: When clarifying variation sources or understanding a process.
Scatter Diagram	Purpose: Assess relationship between two variables. When to Use: When testing for potential correlations.
Histogram	Purpose: Visualize frequency distribution of data. When to Use: When understanding spread or distribution of variables.
Case studies	Bringing it all together for improvement.

Terrific References for Going Deeper

- <https://targethiv.org/forums/clinical-quality-management/quality-improvement-qi-projects-tools-templates>
- Perla, Rocco, Lloyd P. Provost, and Sandy Murray. “The Run Chart: A Simple Analytical Tool for Learning from Variation in Healthcare Processes | BMJ Quality & Safety.” *BMJ Quality & Safety* 20 (2011): 46–51.
- Brassard, Michael, and Diane Ritter. *The Memory Jogger 2: Tools for Continuous Improvement and Effective Planning*. 2 edition. Goal Q P C Inc, 2018.
- <https://asq.org/quality-resources>

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