Quality Improvement in Nephrology

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Outline

- Defining QI
- QI vs research
- QI methodology and tools
- Some examples in nepehrology
- Publications and conferences
- Resources in QI

What is Quality?

IOM definition:

"Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge."

What is Quality Healthcare?

- **Safe**: avoids injuries to patients from the care that is intended to help them
- **Effective**: provides services based on scientific knowledge to all who could benefit, and refrains from providing services to those not likely to benefit
- **Patient-centered**: provides care that is respectful of and responsive to individual patient preferences, needs, and values
- **Timely**: minimizes waits and sometimes harmful delays
- **Efficient**: avoids waste
- **Equitable**: provides care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status

Types of Quality Improvement

- Patient Safety
- Implementation Science
- Quality Assessment
- Systems engineering
- Cost saving/Appropriateness
- Etc.

How is QI different from Research?

- “If the purpose is to assess the success of an established program, and the information gained from the evaluation will be used to improve that program, the activity should not be considered research involving human participants”

Table 2. Characteristics Helpful in Defining Activities as Both Quality Improvement and Human Subjects Research

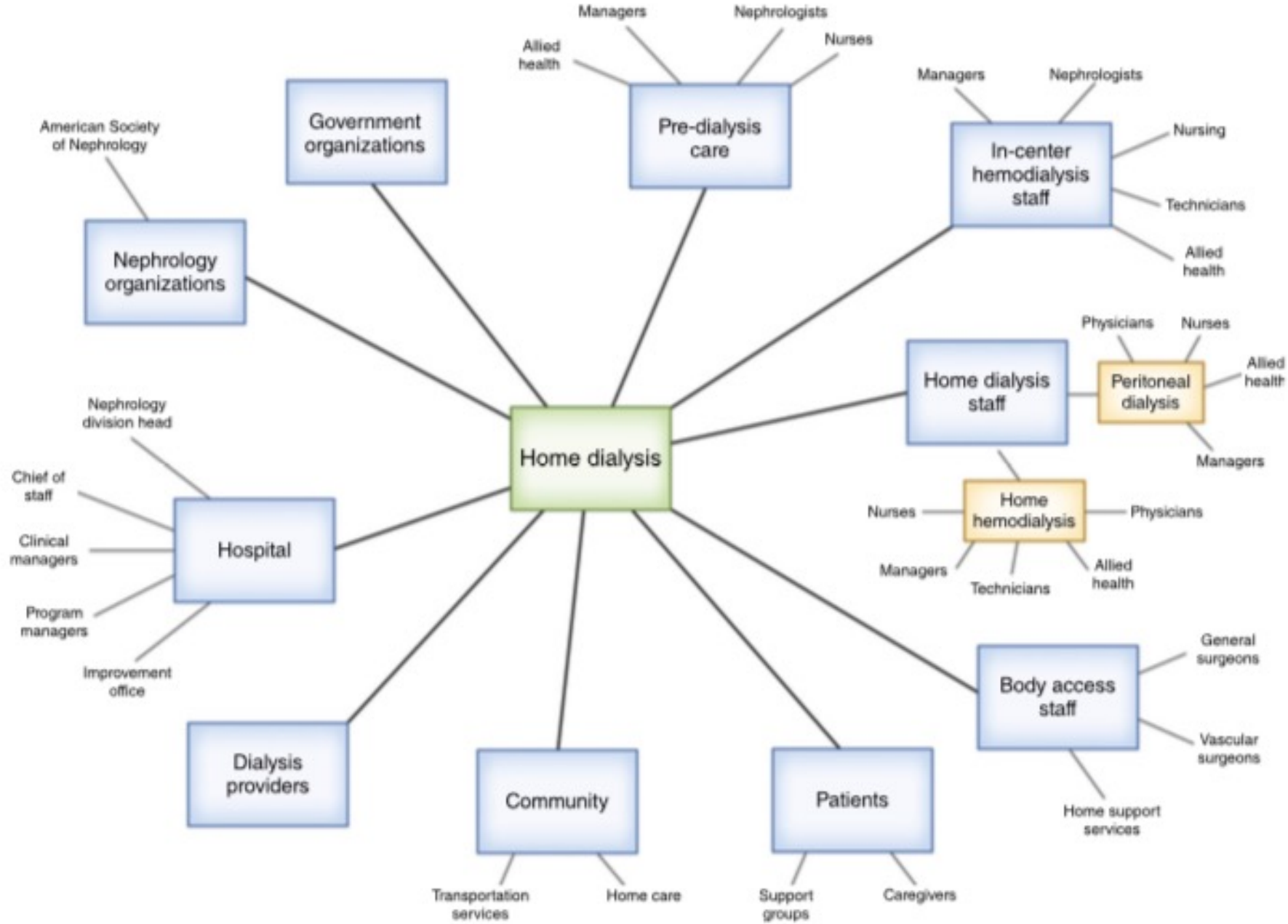
Testing of issues that go beyond current knowledge based on science and experience, such as new treatments
Random allocation of patients into different intervention groups to enhance confidence in differences that might be obscured by nonrandom selection (but not randomization for equitable allocation of a scarce resource)
Deliberately delayed or ineffective feedback of data from monitoring the implementation of changes, especially if this is done to avoid biasing the interpretation of data
Involvement in key project roles of researchers who have no ongoing commitment to improvement of the local care situation, even if others in the team do have professional commitments to it
Funding, sponsorship, or substantial participation by parties outside the clinical setting or organization in which the activity takes place

QI Project - Approach

- Identify a quality gap
- Identify stakeholders:
  - Building a team
- Select an improvement framework:
  - Lean six sigma vs Model for Improvement
- Use the appropriate QI tool
  - Fishbone
  - Process map
  - Spaghetti diagram
- Document your work
  - Run chart
  - A3
- Present/publish your work

Identifying stakeholders

- A stakeholder is anyone who has an interest in a project and can influence its success or failure

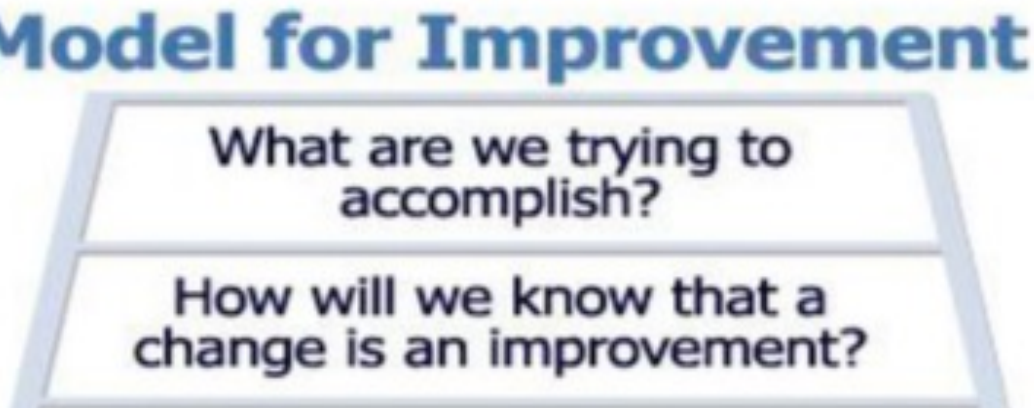

Home dialysis
Pre-dialysis care
Managers
Nephrologists
Nurses
Allied health
In-center hemodialysis staff
Managers
Nephrologists
Nursing
Technicians
Allied health
Home dialysis staff
Physicians
Nurses
Peritoneal dialysis
Allied health
Managers
Home hemodialysis
Nurses
Physicians
Managers
Technicians
Allied health
Body access staff
General surgeons
Vascular surgeons
Home support services
Patients
Support groups
Caregivers
Community
Transportation services
Home care
Dialysis providers
Hospital
Nephrology division head
Chief of staff
Clinical managers
Program managers
Improvement office
Nephrology organizations
American Society of Nephrology
Government organizations

Improvement frameworks

- LEAN/Six Sigma
- Model for Improvement

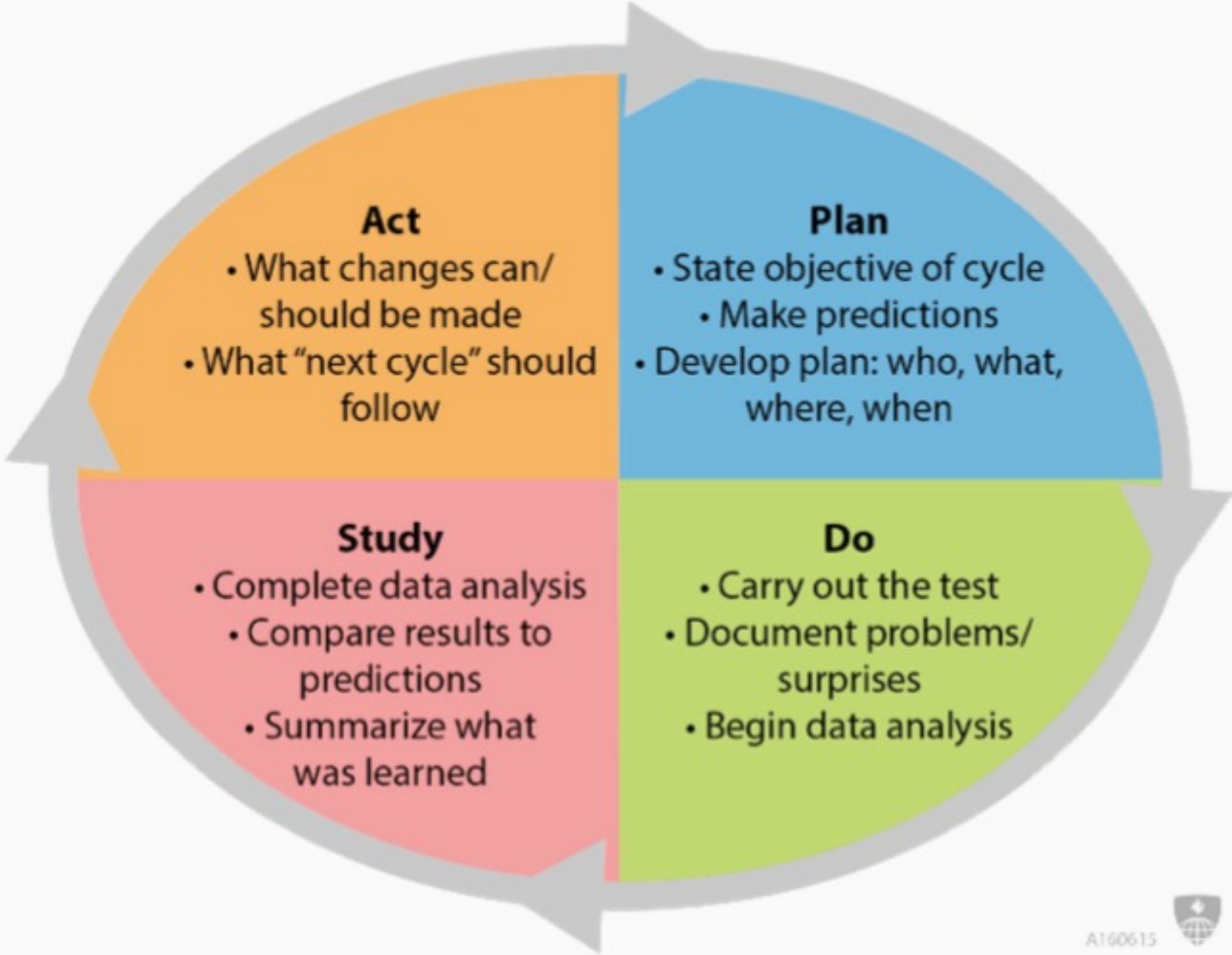
Model for Improvement

- AIM:
- Specific: Clearly state what will be improved in a given patient population by a certain date with responsibility assigned.
- Measurable: Include a concrete numerical goal for assessing progress (increasing the use of home dialysis by 25% in 6 months).



- **Outcome Measures:** Evaluate the effect of the system on patients:
  - The percentage dialysis catheter infection rates per month
  - The percentage of patients treated with a home dialysis option as their initial modality
  - The percentage of patients treated with a home dialysis option within 6 months of starting dialysis
- **Process Measures:** Evaluate system performance and potential changes:
  - The percentage of patients at the predialysis clinic referred for a home dialysis eligibility assessment
  - The percentage of patients who received formal education on home dialysis at the predialysis clinic
  - The mean number of training days required for patients successfully started on home dialysis
- **Balancing Measures:** Monitor for unintended consequences of changes to a system :
  - Patient and family satisfaction with predialysis care.
  - Staff time spent on home dialysis assessments each week

- Developed as a team of stakeholders
- Framework designed for quick changes
- The goal is not to identify perfect changes immediately or the perfect opportunity for change, which can significantly slow down improvement work but is intended to be performed as small imperfect tests of change with a few stakeholders who may even be able to start within days of their initial conception
- Low-risk method to try new ideas that might encounter resistance
- Trying things out on a small scale


Act
• What changes can/ should be made
• What "next cycle" should follow
Plan
• State objective of cycle
• Make predictions
• Develop plan: who, what, where, when
Study
• Complete data analysis
• Compare results to predictions
• Summarize what was learned
Do
• Carry out the test
• Document problems/ surprises
• Begin data analysis

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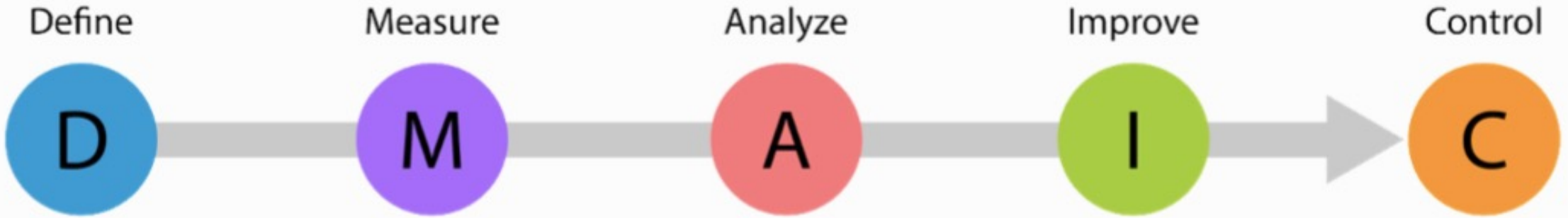
Lean/Six sigma

- **Define:** Determine the key metrics for measuring success.
- **Measure:** Determine past levels of performance to act as a baseline for improvement.
- **Analyze:** Identify the causes of the current quality problems and opportunities for improvement.
- **Improve:** Develop solutions, test solutions, and redesign processes.
- **Control:** Standardize the improvements so that they are sustained.

Plan			Do–Study–Act	
Define→	Measure→	Analyze→	Improve→	Control



Define	Measure	Analyze	Improve	Control
Customer requirements, goals, problems, scope	Validate the problem, inputs, key steps, efficiency data	Develop/validate hypothesis, identify root causes, assess process design	Remove root causes, standardize solutions, implement new process	Establish standard measures and reviews to maintain performance and sustain gains

Tools

- **Define**
  - Voice of the Customer
  - Competitive Benchmark
  - Project ID Tools
  - Project Definition Form
  - Initial Cycle Time Analysis
  - SIPOC
  - As-Is Process Maps
  - RACI
  - Stakeholder Analysis
- **Measure**
  - Value Stream Mapping
  - Cycle Time
  - Process Cycle Efficiency
  - Pareto Charts
  - C&E/Fishbone Diagrams
  - FMEA
  - Check Sheets
  - Run Charts
  - Control Charts
  - Gage R&R
- **Analyze**
  - Value Analysis
  - Cycle/Lead Time Analysis
  - Waste
  - Queuing theory
  - Complexity analysis
  - Elimination candidates
  - Multi-Vari Analysis
  - Box Plots
  - Interaction Plots
  - Regression
  - ANOVA
  - C&E Matrices
  - FMEA
  - C_p & C_{pk}
- **Improve**
  - Brainstorming, Affinity
  - Benchmarking
  - Kaizen
  - Pull Systems
    - Generic
    - Replenishment
  - Standardization
  - Commonizaton
  - Setup Reduction
  - 5S
  - Process Flow
  - Process Balancing
  - DOE
- **Control**
  - Run Charts
  - Histograms
  - Scatter Diagrams
  - Control Charts
  - Visual Control Tools
  - Poka-Yoke
  - Pareto Charts
  - Process Cycle Efficiency
  - Competitor Benchmark
  - Benefit analysis

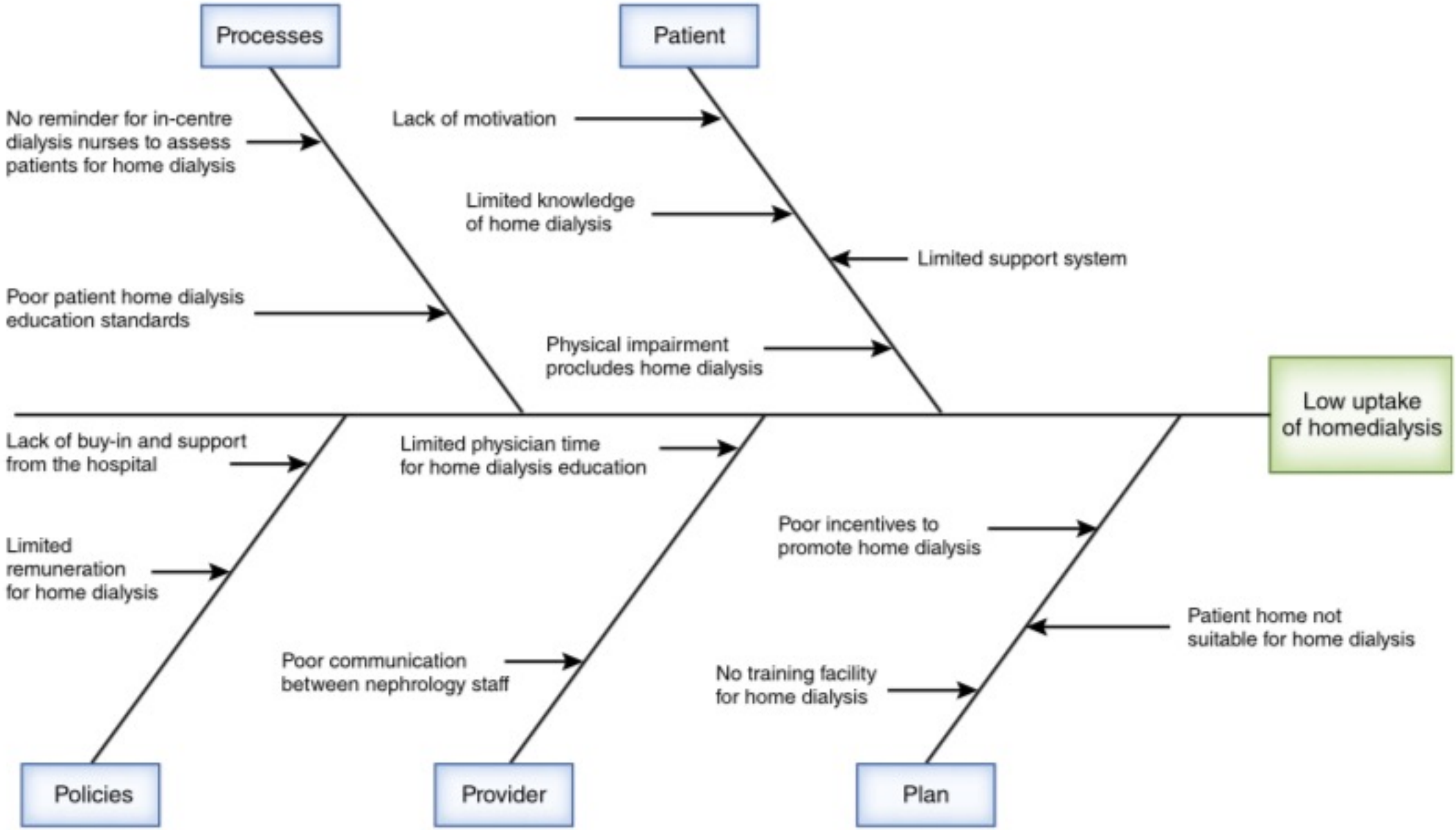
QI Tools: how to come up with a change

- Fishbone
- Process mapping
- Brainstorming: Low impact low cost – dot democracy
- Spaghetti diagram

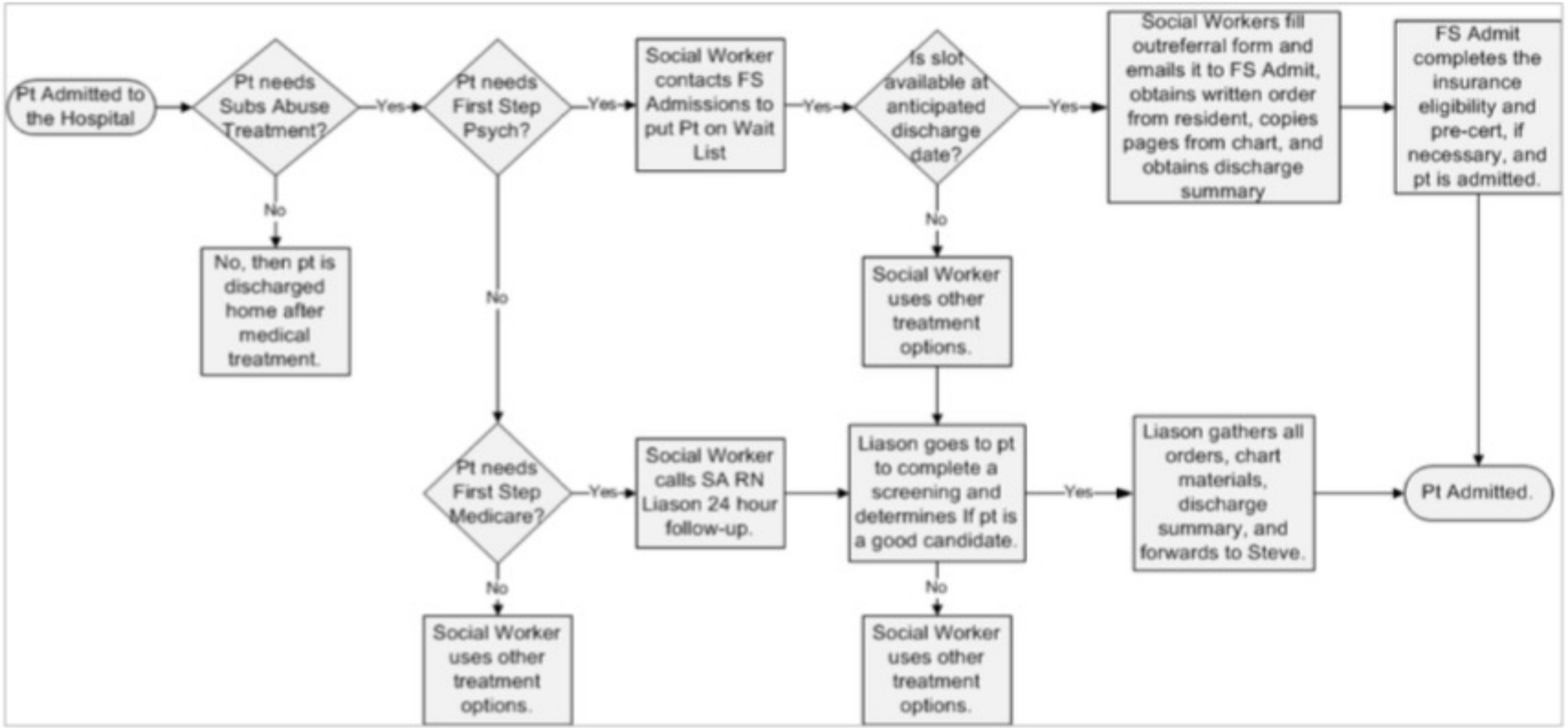
Fishbone – cause and effect diagram

The goals of a **root cause analysis** as they pertain to quality improvement include :

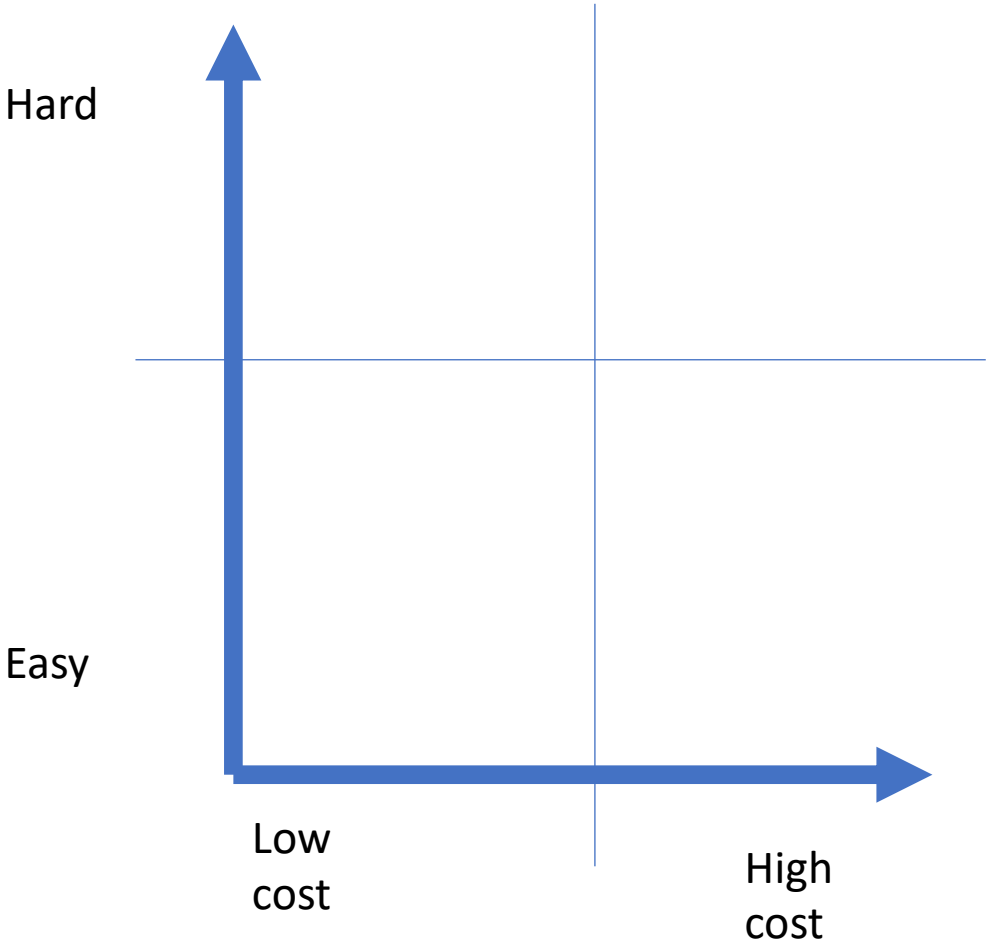
- determining what is happening,
- determining why the outcome is happening, and
- determining what can be done to prevent the outcome from happening again


Processes
Patient
No reminder for in-centre dialysis nurses to assess patients for home dialysis
Lack of motivation
Limited knowledge of home dialysis
Limited support system
Poor patient home dialysis education standards
Physical impairment procludes home dialysis
Low uptake of homedialysis
Lack of buy-in and support from the hospital
Limited physician time for home dialysis education
Poor incentives to promote home dialysis
Limited remuneration for home dialysis
Patient home not suitable for home dialysis
Poor communication between nephrology staff
No training facility for home dialysis
Policies
Provider
Plan

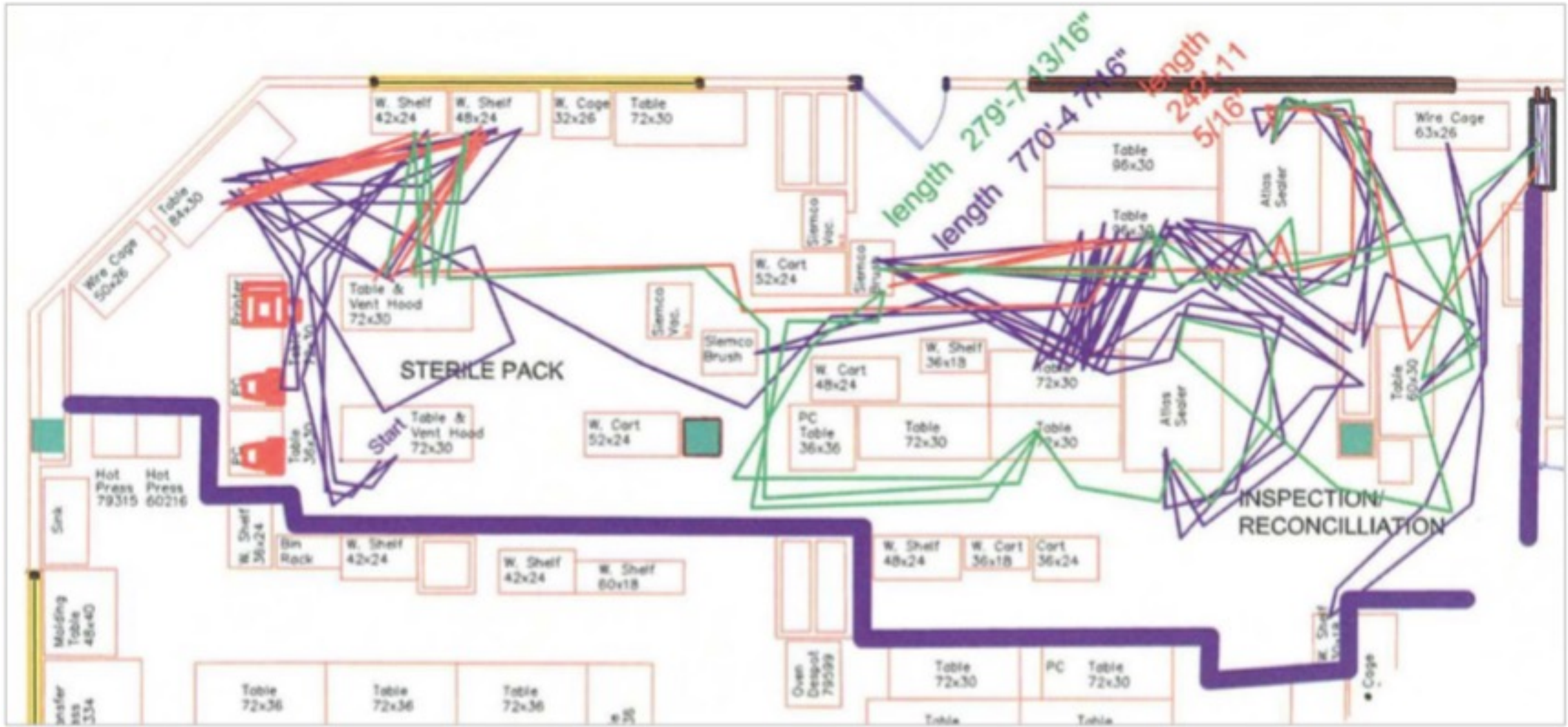
Process Mapping



Brainstorming and dot democracy



Spaghetti Diagram: Captures Motion

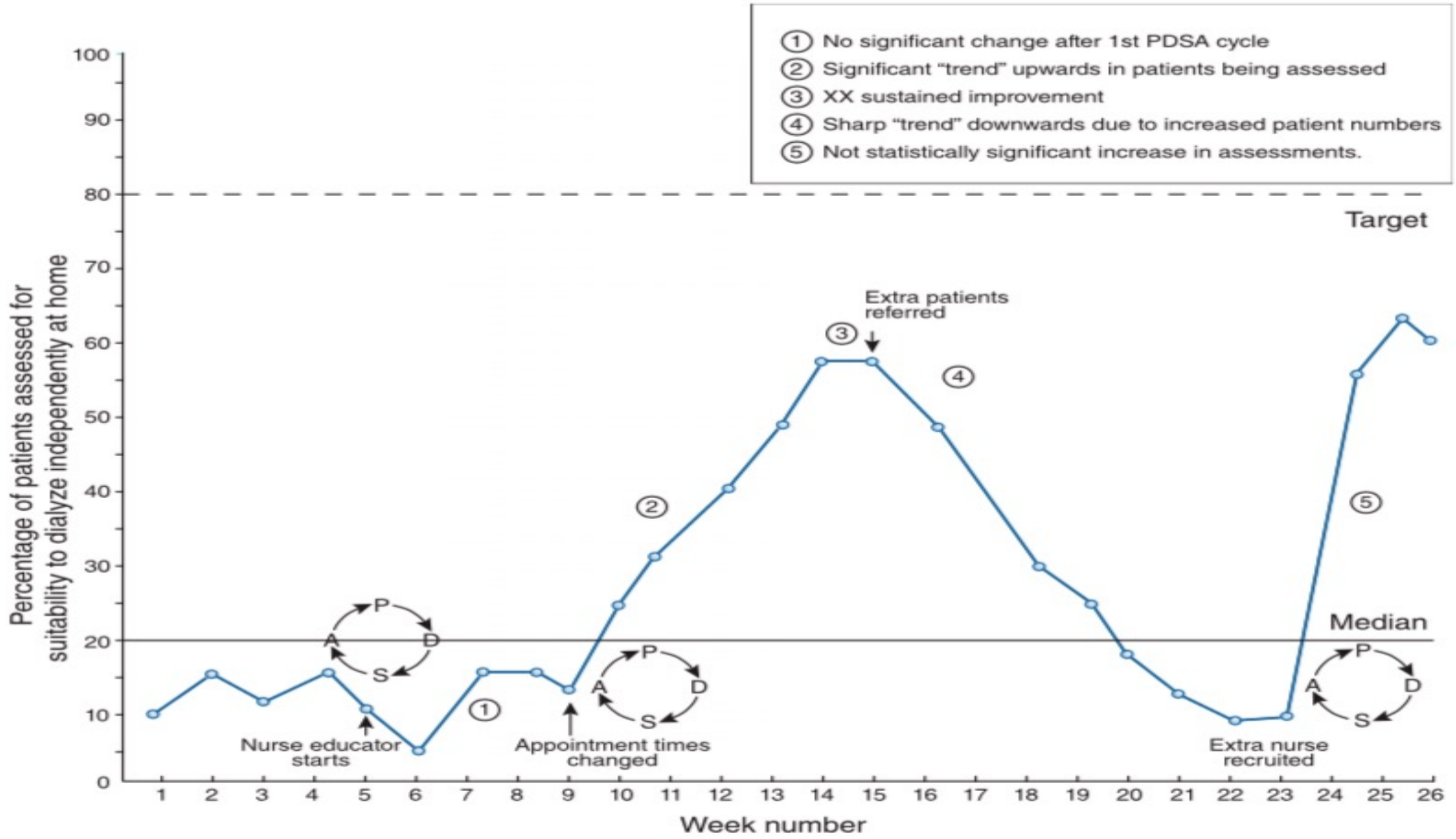


Document your work

- Run charts
- A3 format

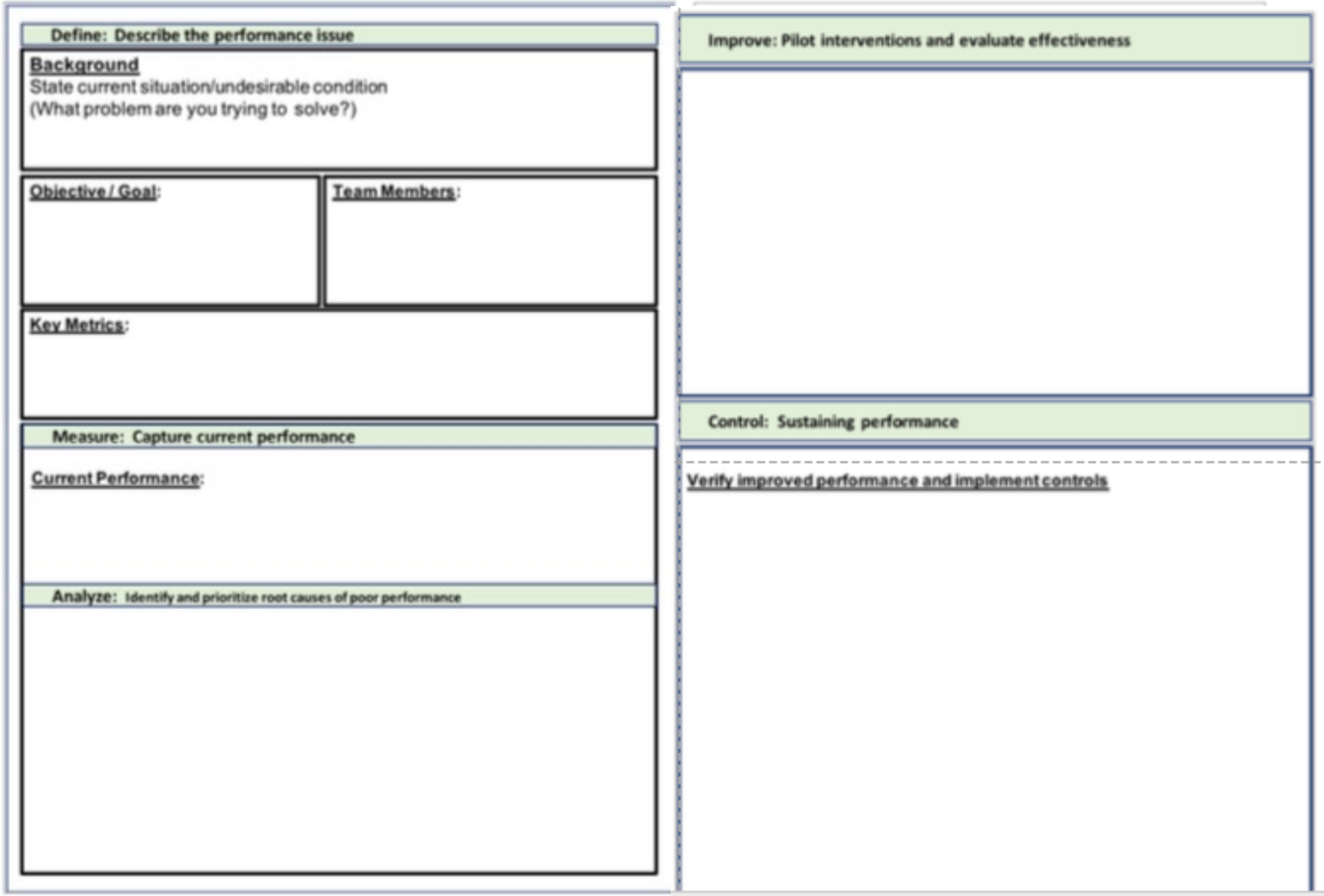
Run charts – presenting your results

- A run chart maps the frequency of a quality measure's occurrence on the y-axis against a unit of time on the x-axis
- In rapid cycle change PDSA cycles, this unit of time is short, typically daily or weekly
- By constructing a run chart and illustrating the points in time that an intervention occurred, we can establish whether the intervention is exerting an effect on the outcome in question



igure 3. | Run chart showing the effect of introducing a nurse educator on the proportion of new referrals to a clinic being evaluated for ome dialysis suitability. PDSA, Plan–Do–Study–Act.

A3 format



Define: Describe the performance issue

Background
State current situation/undesirable condition
(What problem are you trying to solve?)

Objective / Goal:

Team Members:

Key Metrics:

Measure: Capture current performance

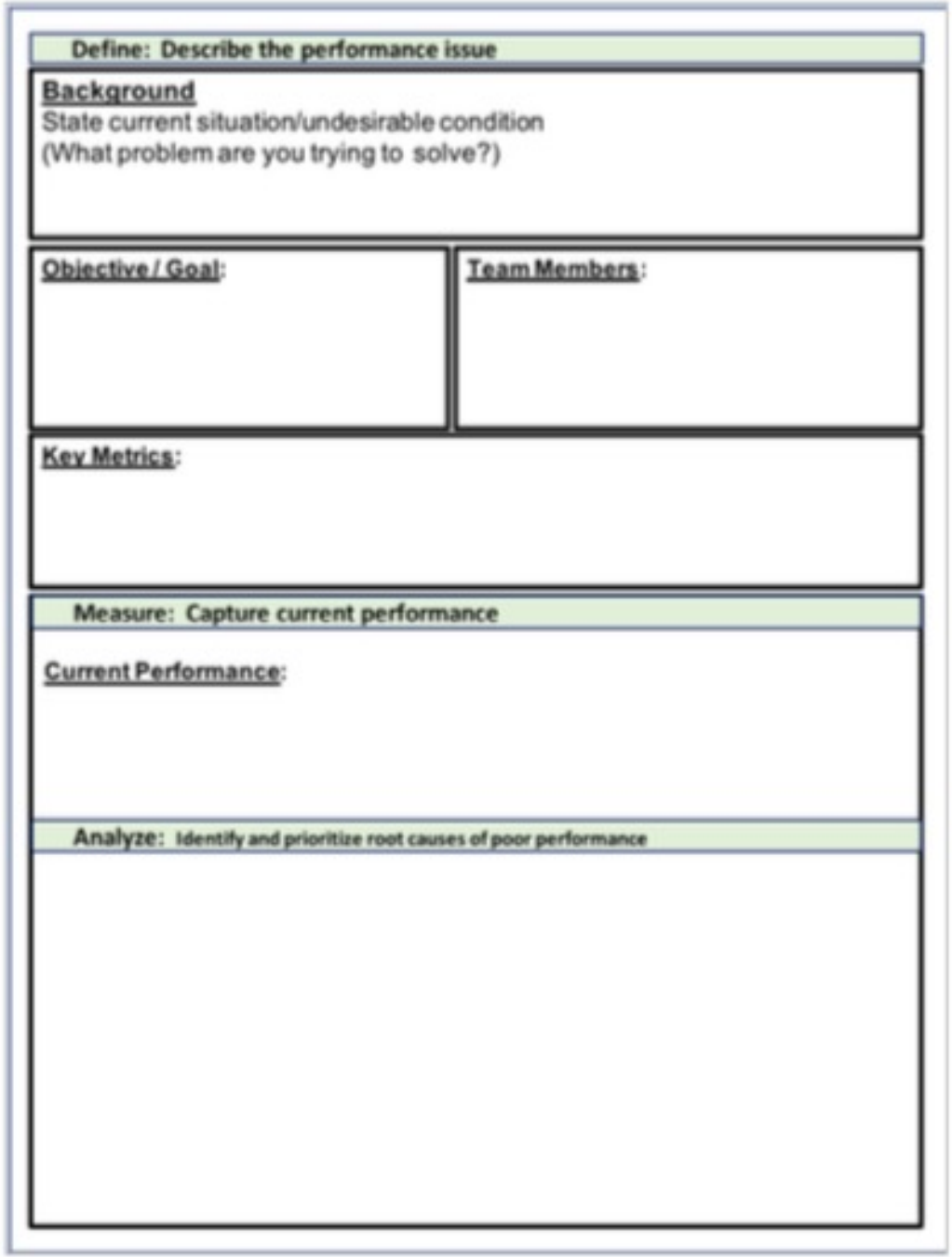
Current Performance:

Analyze: Identify and prioritize root causes of poor performance

Improve: Pilot interventions and evaluate effectiveness

Control: Sustaining performance

Verify improved performance and implement controls



- "Plan" of Plan–Do–Study–Act

  or

- "Define Measure Analyze" of DMAIC

Define: Describe the performance issue

Background
State current situation/undesirable condition
(What problem are you trying to solve?)

- How do we know it is a problem?
- How big a problem is it?
- What will happen if we don't fix this?

Define: Describe the performance issue

Background
State current situation/undesirable condition
(What problem are you trying to solve?)

Objective / Goal:

Team Members:

Key Metrics:

- What is our target condition?
- Who should be on our improvement team?
- How we will measure this?

Define: Describe the performance issue

Background
State current situation/undesirable condition
(What problem are you trying to solve?)

Objective / Goal:

Team Members:

Key Metrics:

Measure: Capture current performance

Current Performance:

Analyze: Identify and prioritize root causes of poor performance

- What data and information do we have on current performance?
- What does the data tell us about the causes?

- Right side of A3
- "Do–Study–Act" of PDSA

  or
- "Improve Control" of DMAIC
- Important to engage frontline staff to brainstorm potential interventions and gain agreement on interventions to pilot

Rev.: March 2, 2012

DEFINE

Background / Problem Statement:

Staff raised concerns regarding peri-operative hypothermia in neonates based on observing several patients (Dec. 20th) with post-op temps of <36°C at NICU return. Ad hoc multi-disciplinary team evaluated the magnitude of the problem, identified root causes and interventions with the Lean Sigma toolkit.

Objective / Goal / Scope:

Eliminate all hypothermia (<36°C) instances in PEDS patients at all times between leaving from and returning to the NICU.

Core Team:

Physician Champion –
PEDS ACCM –
NICU Nursing –
PEDS Surgery –
PEDS Safety –
Surgical Nursing / AI –
AI / Lean Sigma –

Key Metrics: ***(All temps to include method of measurement Hypothermia = <36°C rectally)***

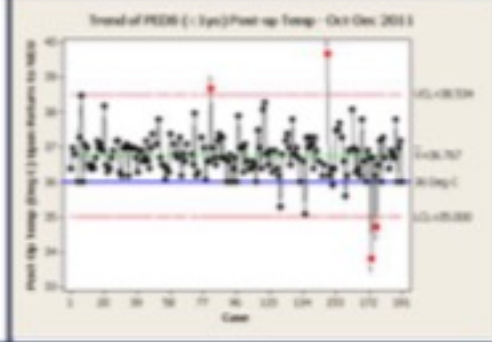
- 'Pre-procedure' Pt. temps = recorded in NICU prior to patient transport
- 'Start' and 'End' Pt. peri-op temps
- 'Post-procedure' Pt. temps = recorded upon arrival from OR to NICU
- Clinical compliance to NICU temperature maintenance protocols.

MEASURE

Initial Baseline:

Data from the EMR between Oct-Dec 2011 were collected to determine the rate of PEDS experiencing post-op temps <36°C :

- 3% of pts. < 1 year old
- 9.5% of pts. <30 days old



ANALYZE

Methods & Root Cause Analysis:

1) Absence of common clinical guideline on maintaining infant normothermia during transportation.
2) Infant warmers found to "cool down" quickly when unplugged for transport.
3) Variation in the temp method used (rectal, temporal, axillary).
4) Insufficient documentation of method within and across settings.
5) Measurement system is flawed as some peri-op "End-Temp" readings recorded in Metavision are clinically impossible due to recording of temperatures after the probe has been removed from the infant – reflecting ambient temps.

IMPROVE

"Completed" and "On-Going" Initiatives:

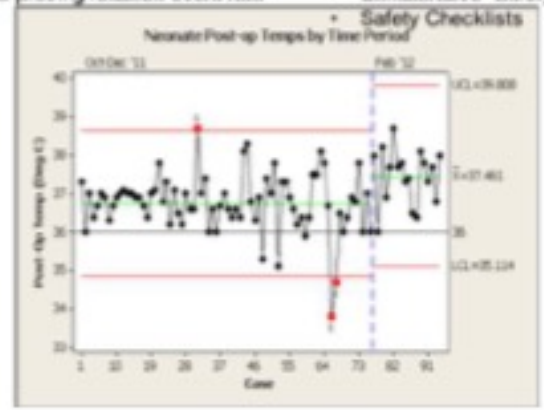
1) Created a PEDS-OR transport protocol (incl. minimum rectal temp for transport).
2) Created a "Pediatric OR NICU Transport Temperature Checklist".
3) Educated NICU and OR staff on use of the protocol, checklist and use of the Giraffe and transport.
4) "Report" activity to the PEDS ACCM Attendings, Fellows and OR Nurses.
5) Piloted use of the protocol and checklist for trips to and from the PEDS OR (2 wks).
6) Reviewed and analyzed the data returned from the pilot.
7) Refined the tool based on feedback from the teams.

Scheduled Next Steps	Date
1) Report results to the PEDS OR Safety Meeting	3/7/12
2) Deploy the similar programs in both PICU and the ED	tbd
3) Present the project findings and experiences at the Armstrong Institute Safety Summit	6/1/12

CONTROL

Improvement Verification & Future Stability Learned "Secrets to Success":

- Compared Pre/Post Intervention data
- Avg. Post-Op temp increased 0.57 Deg C
- Statistically significant shift (p=0.02)
- Small n delays proving reduced event rate
- Multi-disciplinary, ad hoc team approach
- Pro-active, ownership
- Collaborative "Safety Culture"
- Safety Checklists



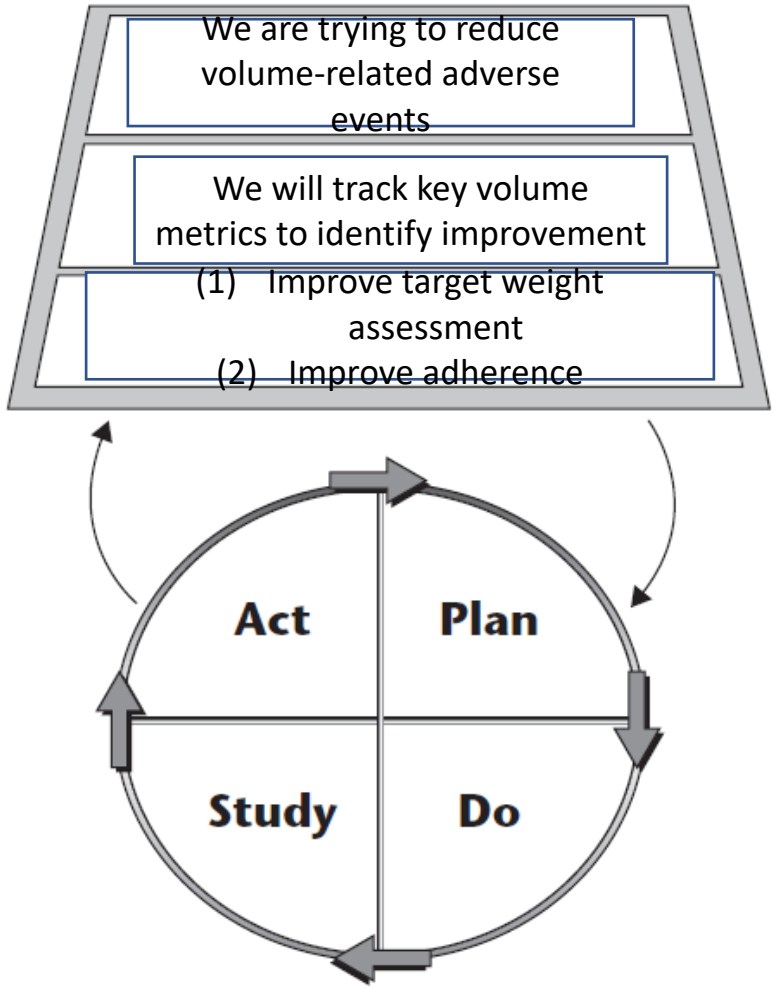
Example QI project - Nephrology

Volume First Initiative – Dr. Dan Blum

Stakeholders engaged

- Nephrologists
- Dialysis NPs
- Dialysis RNs
- Dietitian
- Pharmacist
- Social workers
- Medical director of HD
- Nurse educator
- Nurse manager
- Data analyst
- Patients

FIGURE 1.1 The Model for Improvement



Volume Metrics for improvement

- Volume metrics help identify patients at high-risk of volume-related adverse events

Quality Metric	Alarm Threshold	Clinical Significance
Frequency of IDH	>40 %	1.49 adjusted HR for death at 5 years[1] 1.5 hospitalizations per patient per year[2]
Average UFR	>13 mL/kg/h	1.31 adjusted HR for death at median 2.3 years[3]
Frequency of FTWA	>30 %	1.17 adjusted HR for death at median 2.1 years[4] 2.3% absolute risk increase for ER visit within 30 days[5]

Family of measures

- Reported Metrics:
- # with of IDH>40%
- # with UFR>13mL/kg/h
- # with FTWA>30%

- Fidelity Measures:
- # with BCM +/- LUS within 2 weeks
- # with completed checklist

- Outcome Measures:
- All-cause death
- Admissions for any cause
- Admissions for true ACSC (HTN, HF)

- Balancing Measures:
- Team member satisfaction (survey)

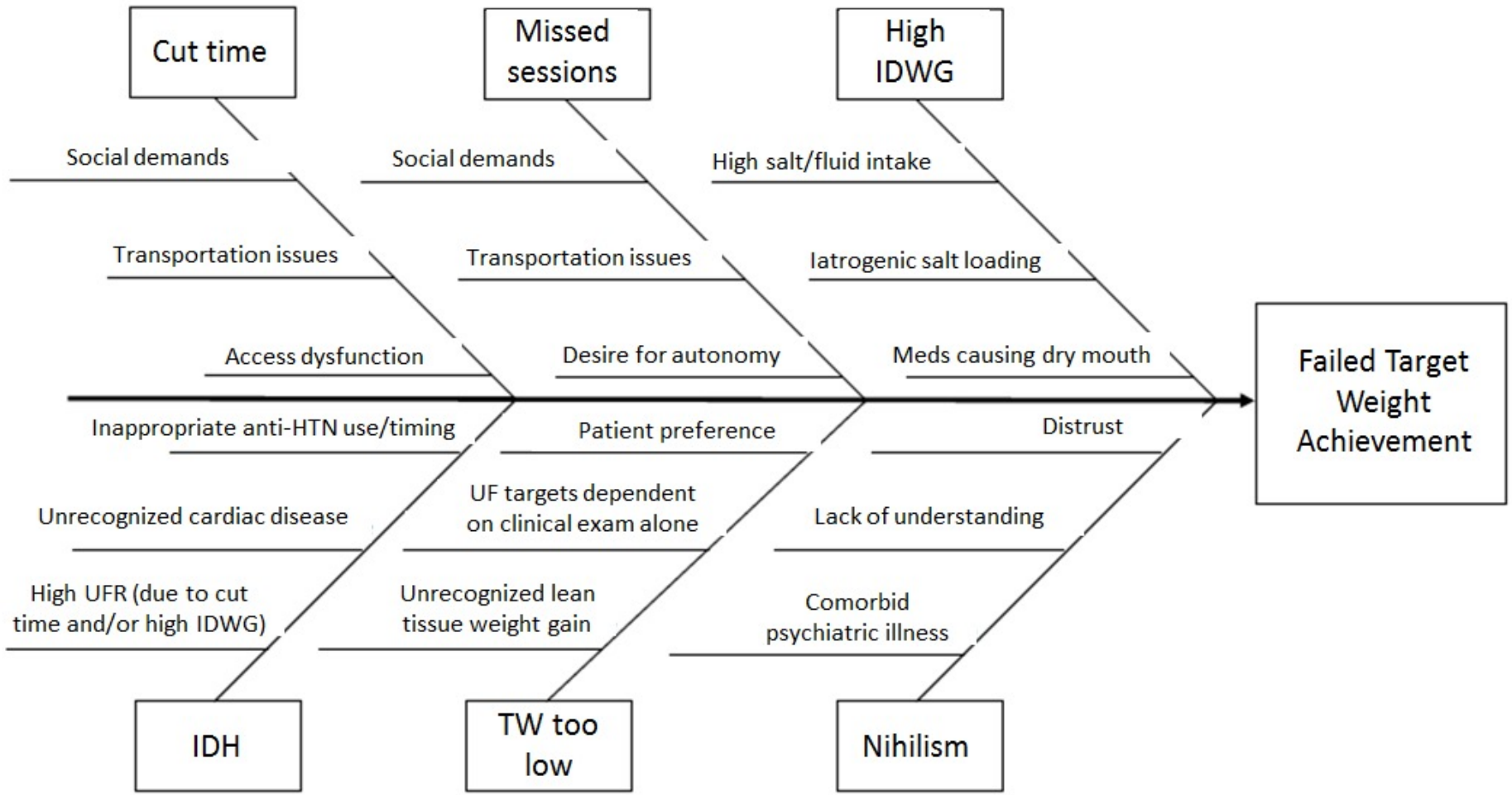
Cause and Effect Diagram

Institute for Healthcare Improvement Open School

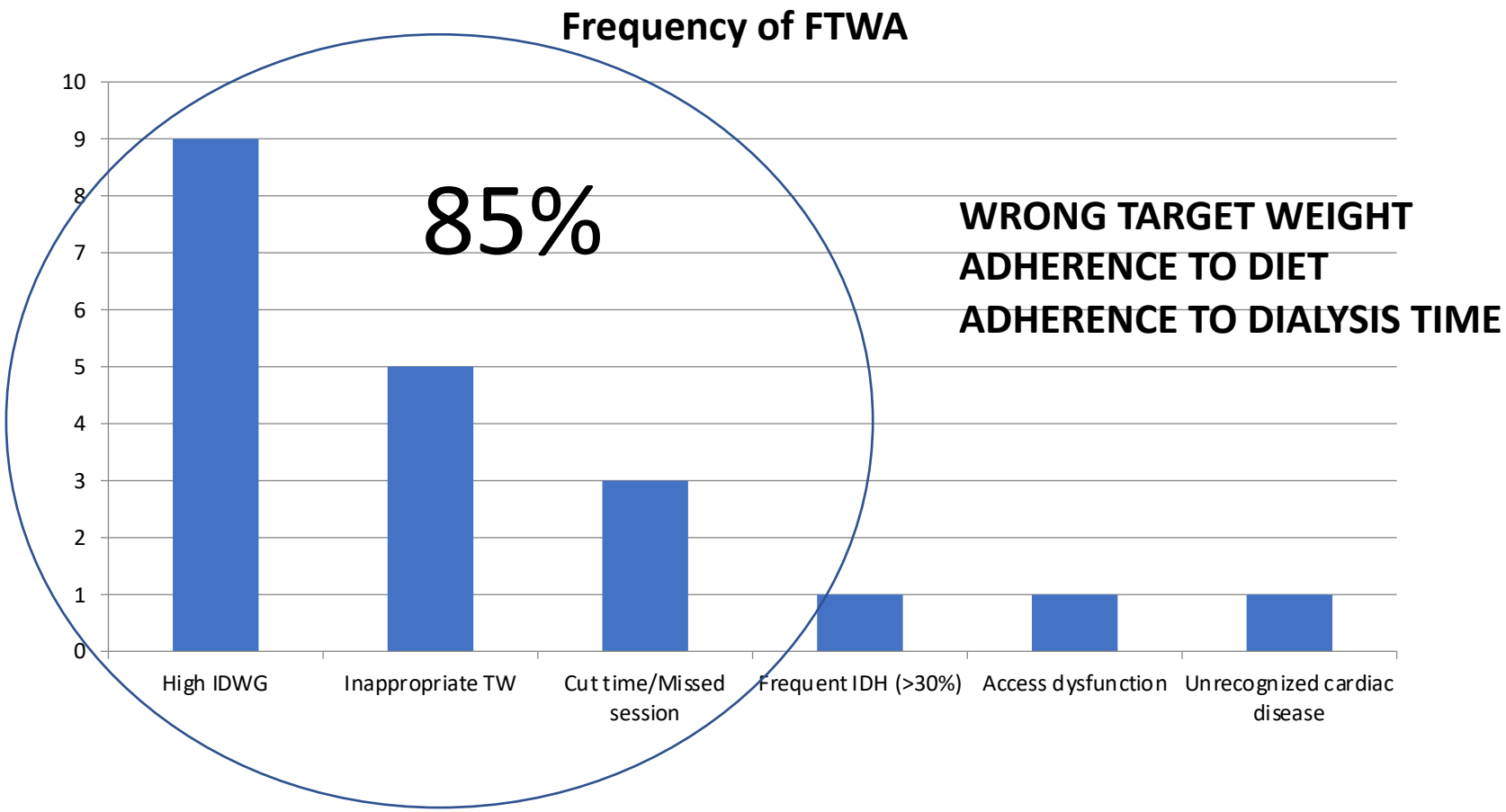
Name: Daniel Blum **University/Organization Name:** In-Center Hemodialysis Unit

Project Title: VolumeFirst Initiative **Health System Sponsor Name:** St Michael's Hospital

Team Members: Daniel Blum, William Souligny, Ron Wald, Arti Sharma Parpia, Sanja Neskovic, Kevin Barlow, Courtney Sas, Elena Nazvitch, Alison Thomas, Ann Jones



Root causes of abnormal metrics



Care Processes Checklist (V1.0)

Clinician checklist

- ❑ Educate on risks of shortening dialysis time
- ❑ Screen for anxiety/depression, ↓cognition
- ❑ Cool dialysate
- ❑ Avoid iatrogenic sodium loading
- ❑ Change target weight: Yes/No

Patient checklist

- ❑ Willing to improve situation
- ❑ Willing to work with multidisc team

Social worker checklist

- ❑ Assess location of dialysis relative to home
- ❑ Optimize transport arrangements
- ❑ Identify social supports

Pharmacist checklist

- ❑ Review anti-BP meds & diuretics
  - ❑ Indication, Alternatives
  - ❑ Timing, Dosage, Dialyzability
- ❑ Consider midodrine:
  - ✓ Recurrent IDH despite tool-assisted volume targeting, average UFR<10, and non-excessive IDWG
  - ✓ No history of peripheral vascular disease or ischemic gut
  - ✓ Hypotension is associated with no compensatory increase in heart rate

Dietician checklist

- ❑ Guidance on salt avoidance
- ❑ Guidance on fluid restriction
- ❑ Self-monitoring IDWG, HBPM

Data from October 2018

High Risk Metrics	MWF1	TTS1
IDH>40%	3	1
UFR>13mL/h/kg	3	1
FTWA>30%	8	2
Moderate Risk Metrics		
IDH 20-39%	9	4
UFR 10-12mL/h/kg	3	4
Flagged for Intervention	12	3

Opportunities to publish

American Journal of Medical Quality (AJMQ)
BMJ Quality & Safety
Cochrane Systematic Reviews (published in the Cochrane Library)
Health Services Research (HSR)
Health Care Management and Review (HCMR)
Implementation Science
International Journal for Quality in Health Care
Joint Commission Journal on Quality and Patient Safety
Journal of Patient Safety and Risk Management
Medical Care Research and Review
Quality Management in Health Care

Resources for QI

- IHI open school
- Lean Six Sigma Green Belt for Healthcare
- Masters programs:
  - Toronto: Masters in Quality Improvement and Patient Safety
  - UDM: Maitrise en gestion de la qualite et de la securite des patients
  - Hopkins : Masters in Patient Safety and Healthcare Improvement
  - Harvard: Master of Healthcare Quality and Safety

Thank you!

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