Personal Continuous Improvment Work Book

An engaging way to using Quality Improvement Tools

Duncan Neuhauser et al

Personal Continuous Improvement Work Book

Duncan Neuhauser, PhD Department
Of Epidemiology and Biostatistics
School of Medicine
Case Western Reserve University
10900 Euclid Avenue, Cleveland,
OH 44106-4945,
duncan.neuhauser@case.edu

Silvia Myhre, MBA
Santee, California

Farro.kh Alemi, PhD
Graduate School of Health Science
Gebrge Mason University
Tel 703-993-4226
falemi@gmu.edu

Foreward to the Seventh Edition

This workbook was first produced in 1997 and since then has been used by health professional students all over the world to learn about quality improvement and what is needed to change some aspect of one's life. This book is in the public domain and can be reproduced without permission. It is available online at www.mceconnection.org under "personal quality improvement 2001".

It has been translated into Norwegian (Second edition by Jana Kyrkjebo), Swedish (Second edition by Michael Bergstrom), Chinese (by Jain Wen Cao), Portuguese (Helen Smits), Korean and German.

If you wish to benchmark your project against other projects, this can be done at Dr. Alemi's website http://improvement.gmu.edu . Also, see Alemi, F. Neuhauser, D. Ardito, S., Headrick, L., Moore, S., Hekelman, F., and Norman, L. "Continuous Self Improvement :Systems thinking in a Personal Context" The Joint Commission Journal on Quality Improvement, February 2000 Vol 26 No 2 pp 74-86.

Kingsham Press gratefully acknowledges Prof. Duncan Neuhauser's generous permission to reproduce with changs to the layout and presentation of this work book.

Contents

Summary

The purpose of this manual is to assist people in developing a personal quality improvement project utilizing various standard quality improvement “tools”. The second stage and overarching aim is to teach the understanding of quality improvement ideals on a personal level, subsequently applying this knowledge in a professional setting.

Thoughts for Improvement:

* Before you try to solve a problem, define it.
* Before you try to control a process, understand it.
* Before trying to control everything, find out what is important.

Background

The assignment of creating a personal quality improvement plan can be, at first glance, a rather intimidating task. You might ask yourself: ***What exactly does personal quality improvement mean? How can I improve it? Will it take long? What's in it for me? How will this help me when I'm at work?***

Let's look at the questions, one by one. First, what is personal quality improvement? This is a term used for identifying areas in our personal lives that create waste or redundancy of effort; in general, a mismanagement of resources. The first task is to identify areas perceived as "opportunities for improvement". For instance, what do you currently do, that can either be done better, quicker or with less waste? Students have done projects focusing on improvements in areas such as: getting to work on time, better use of time in studying, or improved budgeting on spending money.

Second, how can I improve? Once you have identified an area to be improved, immediately begin to keep data on the process. The more information you are able to gather, the stronger your analysis will be. If you want to improve your financial position - start today, write down all your expenditures! Once you have collected adequate data, the analysis can begin. Using the various tools and charts described in this manual, you can evaluate the data for trends, areas of waste, and opportunities for improvement. In many cases, getting the information down on paper can be an eye opening experience. After they have compiled several weeks of data, students are amazed at the amount of money spent on "junk" food, or time wasted because of a "bad" process. With this information, you are armed with the knowledge of where improvements can be made. Small changes at first are recommended. Test them out, look at your results, draw conclusions from what you have learned and continue the process.

This leads into the third question: Will it take long? The bottom line is improvement is an on-going process; it never really ends. The good news is that by working in small cycles, gains or improvements are long term and the likelihood of failure is minimized. Most often, an improvement project is explored (perhaps through the prompting of a class project), then implemented. Positive results generate additional improvement projects, typically on a larger scale, utilizing the same principles and tools to solve professional projects. Before you know it you have several projects running simultaneously, on a personal level and professional level.

Of course, as a person with minimal free time, it is natural to ask: What is in it for me? With regard to course work completing the project will of course help your grade. But, you are interested in the "big" picture. Learning the tools of quality improvement will enable you to understand the areas of waste that plague both professional and personal time. You will have a better understanding of methods used to improve all areas of your life. This translates into a variety of improvements such as more free time, better health, a better work environment, improved customer satisfaction, or improved work flow.

The final question: How will this help me when I am at work? If your improvement project was to get to work on time, the answer should be fairly clear. But we all know that there is more to the process than just getting to work on time. Understanding the quality improvement process on a personal level makes the lessons learned more salient. It creates a sense of accomplishment and that feeling can be contagious. Once you have mastered the first project, the second one isn't quite as intimidating. The tools and the approach are the same for a professional project. The players will change and the data to be collected will change, but overall the process remains constant. Start small, make changes, analyze results, realize gains, continue!

Suggestion: Do something you can measure at least everyday. If you can only measure once a week it takes a long time to show you have made a significant difference. Things like exercise, diet, blood pressure, time management, are good because they can be measured frequently.

In addition to this, as a leader in the health care field, personal demonstration of quality improvement techniques reinforces its importance. This sends a strong signal to the organization of your commitment to improvement.

Helpful Hints:

- Clearly define your goal for each cycle - Put it in writing!
- Keep a log or diary of your progress.
- Data collection should be on a daily basis - start immediately!
- Assemble data graphically (see the section on tools).

Langley, Nolan and Nolan Model for Improvement

Langley, Nolan and Nolan have written extensively on improvement processes. Improvement comes from the application of knowledge; therefore, improvement must be based on building knowledge and applying it appropriately. Langley, et al believe that there are three basic questions that form the basis for the “Model for Improvement.”

1. ***What are you trying to accomplish?***

   - Provides an aim for improvement efforts
   - Keeps effort focused

2. ***How will we know that a change is an improvement?***

   - Provides criteria for determining if the change resulted in an improvement
   - If criteria improve and are sustained over time, then it can be concluded that the change is an improvement

3. ***What changes can we make that will result in improvement?***

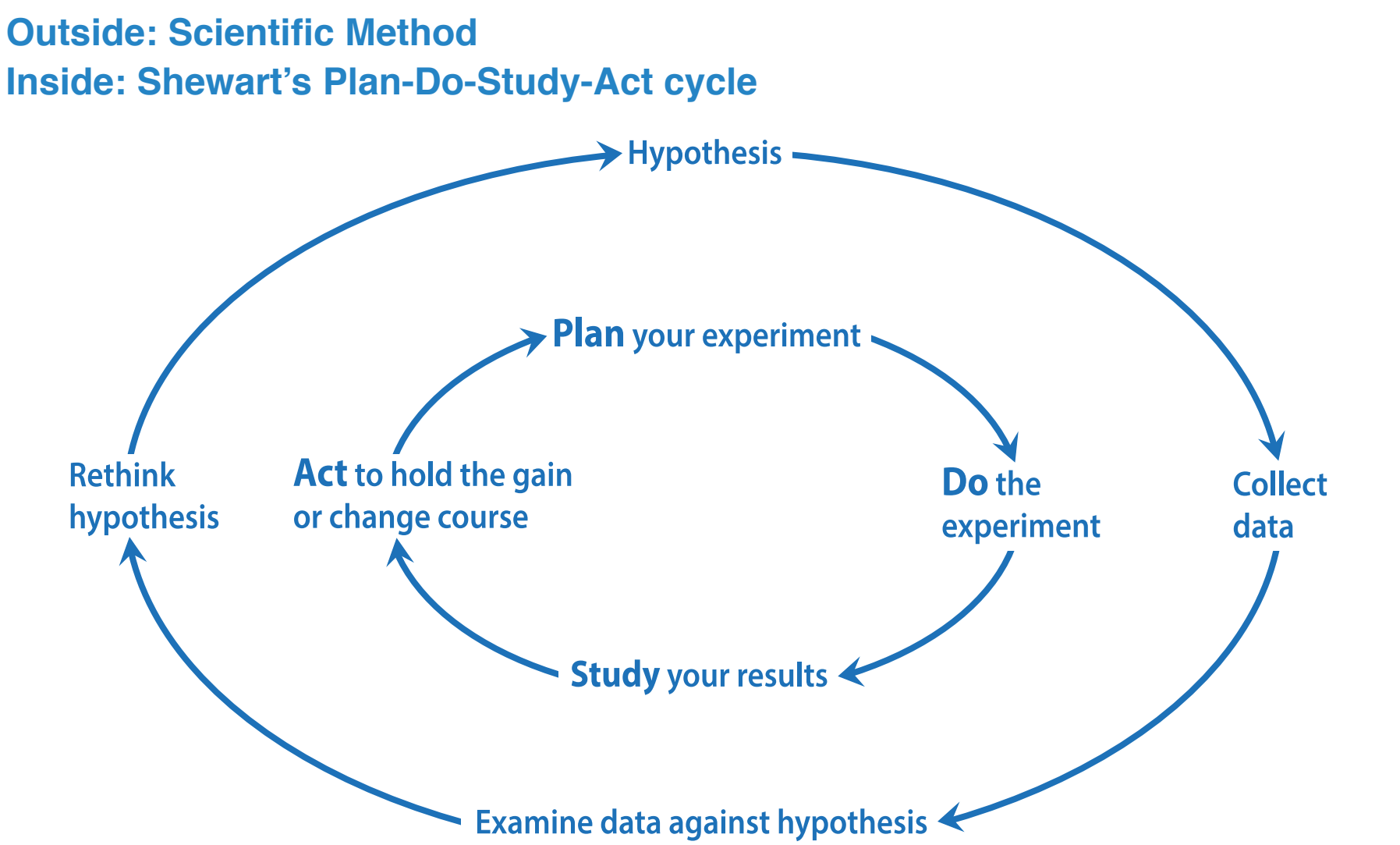
   - Develop change and test on small scale
   - Test done to predict effect of change. Provides flexibility for alterations to the effort (see PDSA cycle).

PDSA Cycle

Plan-Do-Study-Act (PDSA) Cycle:

Description: The PDSA cycle is a method by which improvements can be made on small scales and examined for success, prior to continuing further changes. The exercise should have built into the procedure clear measures to check progress. This is also referred to as the PDCA cycle: Plan-Do-Check-Act.

Method: To begin a PDSA cycle, start by clearly identifying an area that you would like to improve. For example; **decrease frequency of snacking, increase number of sessions at the gym, improve budget control.** Be sure that your improvement allows adequate data collection (i.e. something that you can monitor on a daily basis). Start your data collection ***immediately!*** The more information you are able to gather and process the better analysis you can perform.



After you identify a process needing improvement, develop a ***Plan*** that you believe will help you achieve your goal. Write down the plan delineating clear goals. A personal plan might be wake up earlier, more time for exercise, or reduce the amount of money spent on "junk" food.

The next step is to implement the plan (Just ***Do*** it!) It is important to rigorously pursue data collection which will measure whether or not the plan has been successful.

After you have pursued the plan for a period of time ***Study*** the results. Does the data support change (improvement)? Do you need to modify the plan or make alterations?

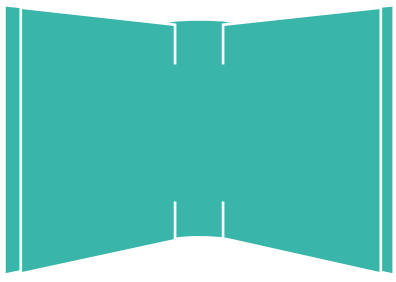
If modifications are necessary, then make them and ***Act***. Also important in the "act" phase is positive action to consolidate, strengthen and support the change achieved. This requires explicit energy - without it, things tend to slide back to the status quo. The cycle starts all over again. As changes are made to the initial plan, it is similar to developing a new plan and therefore, the process continues: ***Plan***, ***Do***, ***Study*** and ***Act*** once again.

A Practical Example

Example: Mary has decided to improve her health. One way to achieve this goal is by reducing her weight 15 pounds. She knows she can do this through a variety of methods, including exercise and diet control. The first method she would like to try is to follow a low fat/low calorie diet. Mary's PDSA cycle might look something like this:

Plan: Go to the library and check-out several books on nutrition. Plan a menu for one week that has a reduced calorie/fat intake. Mary's aim for the first cycle is to lose 3 pounds in one week.

Do: At the beginning of the experiment, Mary weighs herself in the morning, noting her weight. She maintains the diet for one week. Everyday she weighs herself and records the number



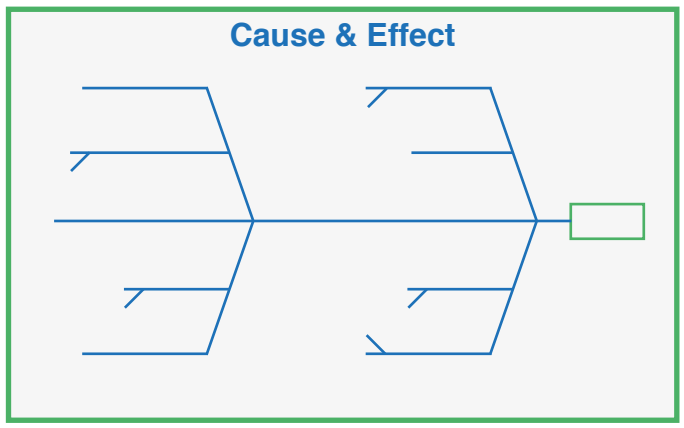
Study: At the end of the week if she has lost the weight as intended, the diet (plan) is working. If not, she needs to re-evaluate her plan.

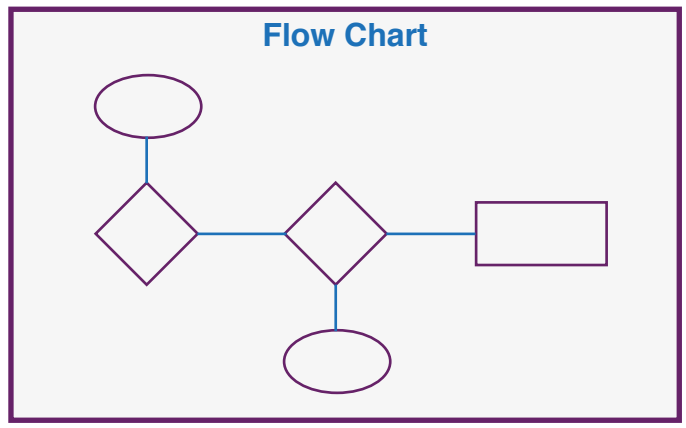
Act: If the diet is working, she will continue the process every week to lose the desired 15 pounds. Everyone who has tried to lose weight knows that the work doesn't stop when the goal weight is reached. Further effort is needed to keep the weight off (hold the gain)!

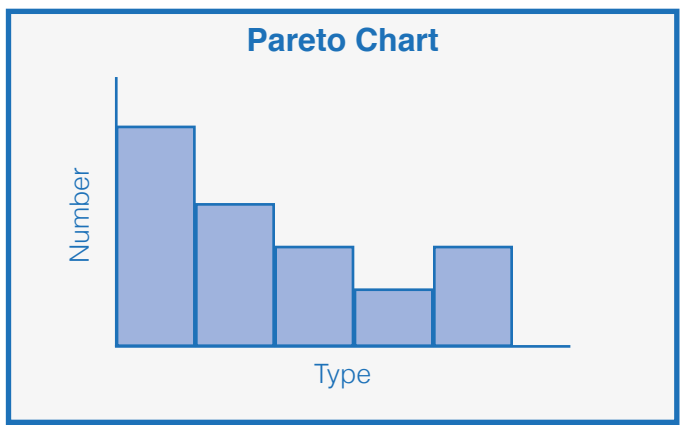
Seven Tools of Quality

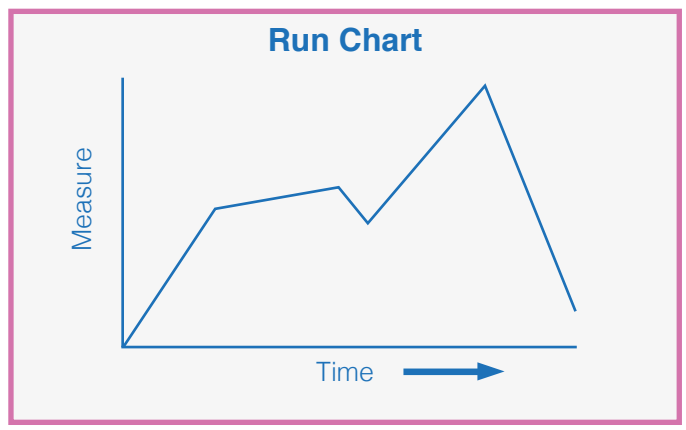
The following section outlines various charts and instruments utilized in improvement efforts. These tools can be used to better understand a process in order to improve it. Not all the tools will be applicable to the data you are collecting. Be sure to first look at the information and understand what it is you want the information to tell you, then pick an appropriate tool. More than one can be useful to measure different aspects of your study.

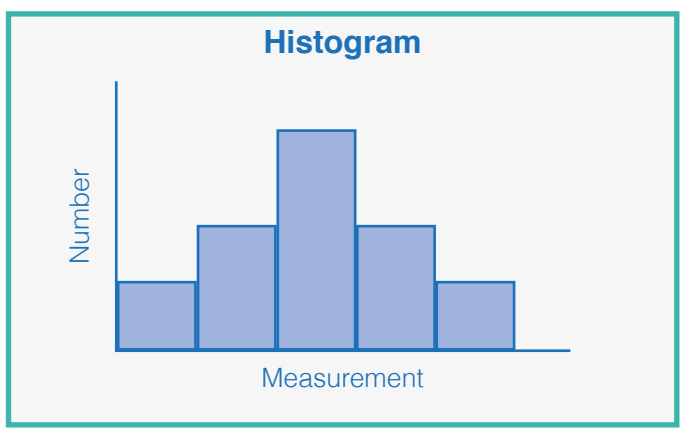
Seven Quality Control Tools

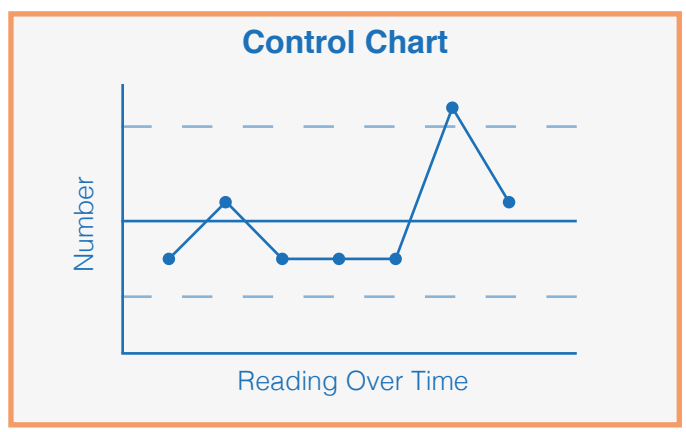


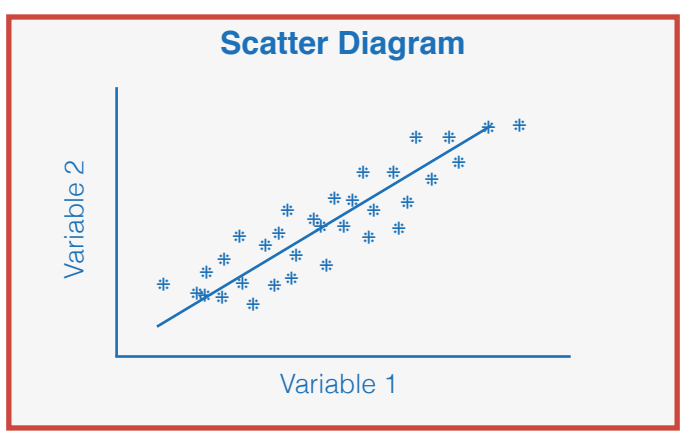












1

Flow Chart

Definition:

A system used to understand and make a picture of an entire process. For complicated processes it is important to have all members participate in the design of the flow chart, to have all operations properly represented.

Method:

If possible, gather all participants connected to the process. Start at the beginning and put down on paper the steps that are required to complete the process. It may be helpful to draw a map of the physical locationof equipment or departments to facilitate the movement of goods/paper. Be sure to include all steps.

Student Project:

A recent improvement project submitted by a student focused on incorporating exercise into an already hectic work schedule. She prepared a flow chart to demonstrate the various steps required to integraed it into her daily schedule. A copy of the flow chart title “Will I walk today?” is on page 11.

Advantages:

People working within the process understand their own area best, which can be fit into the overall p r o c e s s . Once the entire process is laid out improvements can be easily identified.

Pitfalls:

Can be time consuming. Difficulty in coordinating all the proper participants. Too many “why” questions when first preparing diagram. Get all the information down - as it currently occurs - then analyze.

One Intern's Experience with an Admission

Call from unit clerk:
"Mr H is here!"
08:09

Is he a 10 B firm patient?
No → end
Yes

Is his admit time long call?
No → end
Yes

Finish rounds with SAR

08:19
Stop rounds
Night Float signs out

08:45
RN from floor calls:
"Can Mr H have breakfast?"

08:58
Look at ED Sheets (can't read), labs (none) call for medical recommendations (no answer)

Find the chest X-ray and look at it

Go see patient

Start history and physical (H & P)

Decide patient is sick now!
Yes

Look for blood culture supplies

Find supplies on neighbouring floor

Draw labs and blood culture

Find imprint card and lab slips, find chart paper, make out and sign the slips

Call for more pneumatic tubes to send labs (none there)

Tube labs (each in its own tube) - microbiology, hematology and chemistry

09:50
Find patient ID card, find paper, and write orders

Answer a call from another intern:
"Where are you?"

Finish orders;
write orders a second time on antibiotic sheet: tax to pharmacy

Find Mr H's RN

Go over orders with the RN

Answer call from hematology lab:
"Why two tubes?"
"Because I had the blood"

10:13
Give my pager number to unit clerk (patient is a boarder on different floor)

10:26
Answer page for stat work on another patient

11:00
Continue to round on other patients

11:36
Finish rounds

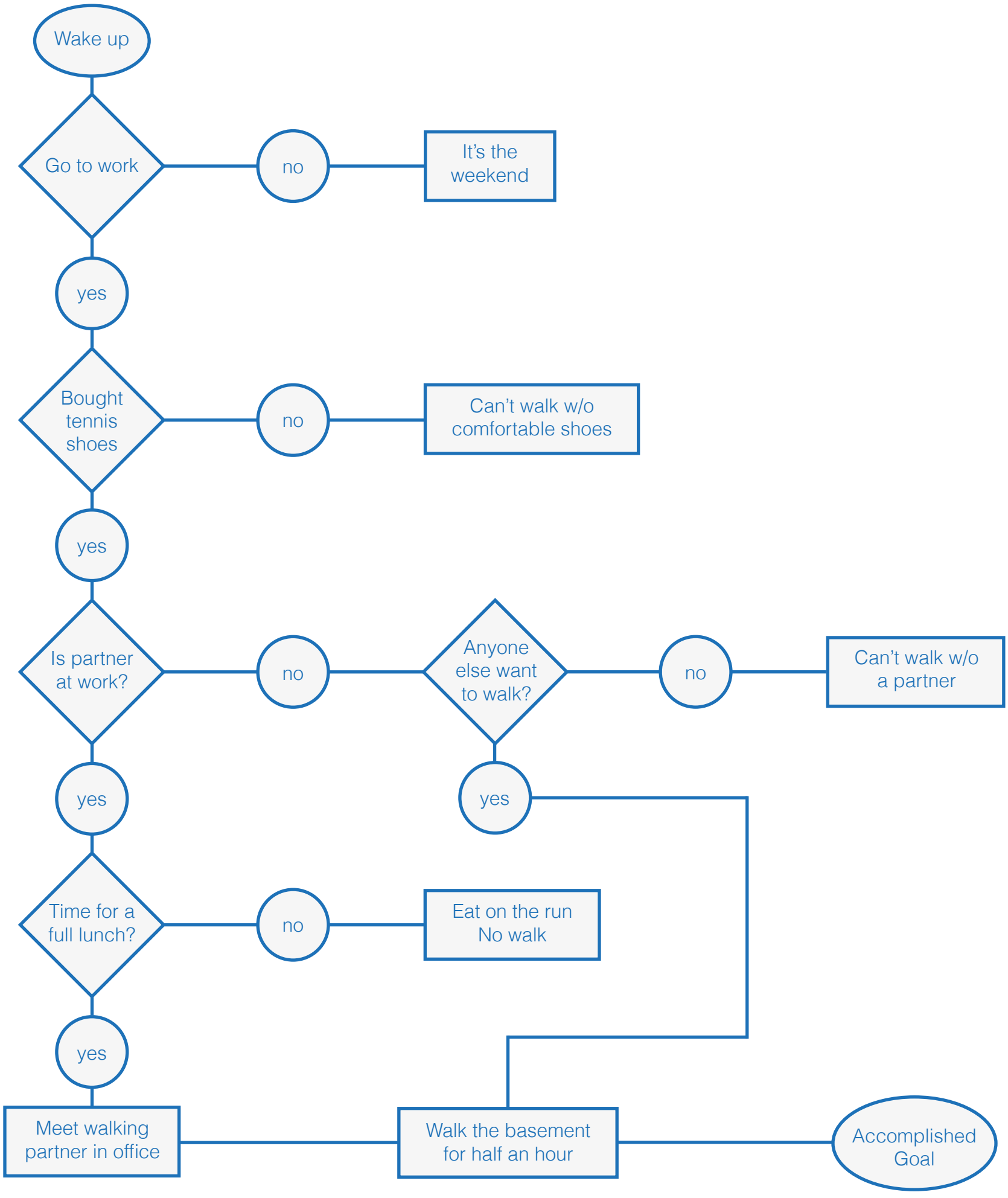
11:43
Finish H&P on Mr H

12:17
Work-up finished

12:22
Call again for medical records

15:30
Mr H gets antibiotics

Flow Chart - “Will I Walk Today?”



2 Cause-and-Effect Diagram (Ishikawa or Fishbone diagram)

Definition:

A method for analyzing process dispersion. The purpose is to relate causes and effects.

Method:

Determine the area you want to improve. A good idea is to write this statement on a piece of paper to remind you of the aim (the effect). List all the items that promote this effect. These become the main “causes”. Pull out your magnifying glass and examine what leads to these main causes. A good suggestion is to look at the issues in their broadest sense. Many items may be brought to the table that are beyond your control, but having them out in the open facilitates the understanding of their impact.

If we look at the example of Mary wanting to lose weight, she realizes that she is not getting enough exercise. Therefore, the “Effect” is “lack of exercise”, but what really causes Mary not to exercise? Some ideas she came up with include: lack of time, the gym is closed, bad weather, or not in the mood. These are her main “causes”, but if she digs a little deeper the lack of time issue can be attributed to her wanting to sleep in late because she was up late watching TV.

Student Project:

Another project was completed by a student who wanted to begin an exercise routine. After monitoring her activities for one month, she created a fishbone diagram to identify underlying components. As you will see in her Fishbone diagram labeled “Exercise” on page 14 she cited four main functions that contributed to the exercise routine.

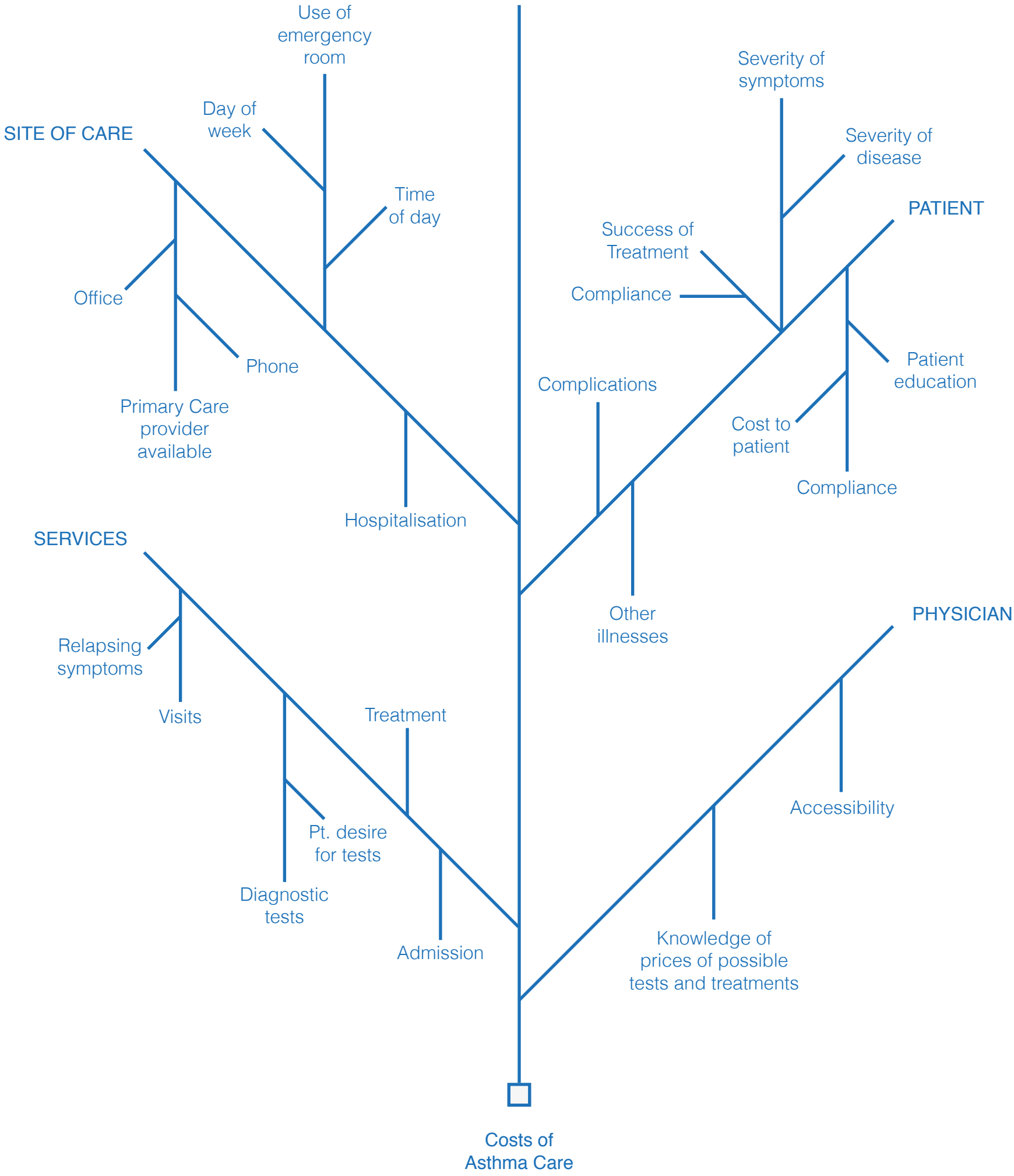
Advantages:

Provides an excellent means to facilitate brainstorming by focusing on issues at hand.

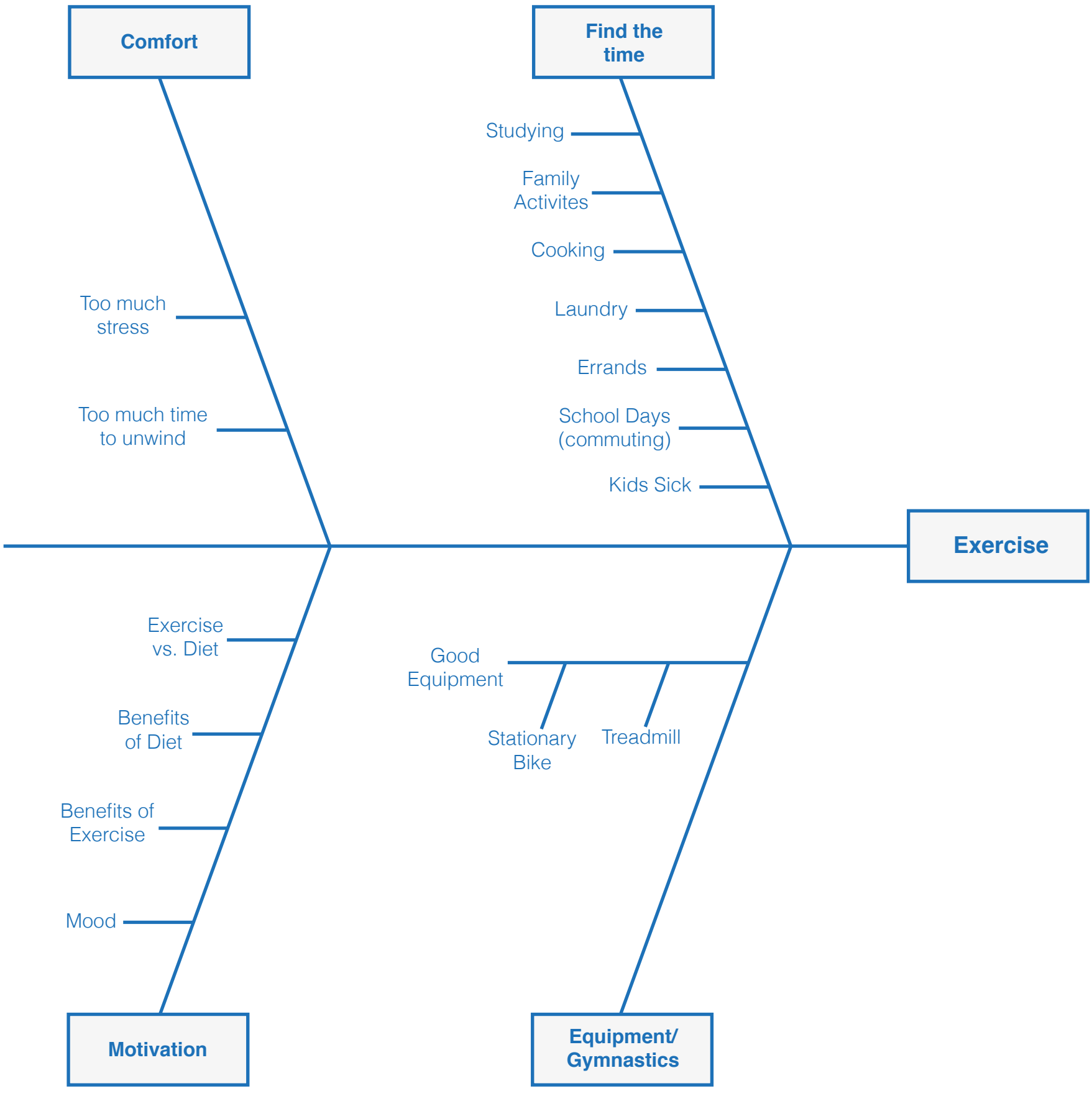
Pitfalls:

Might become very complex, requiring time to work out. Also may be difficult in some areas to sort out relationships and get them down on paper.

Causes of Cost Variation For Asthma Care



Fishbone diagram: Reasons for Exercising



3

Control Chart

Definition:

A control chart is a method that looks at data collected in a process, understanding that variation will occur. Built into this system is the tolerance for variation (upper and lower control limits). Identifying the items that fall outside the control limits will assist in locating the issues that are causing this tremendous fluctuation. The aim is not to redesign an entire process, but to locate the factor that is causing the disruption.

Method:

Collect data on the process you are evaluating over several days, batches or lots. Figure the average(xl and the average range of the data (R). To calculate the upper and lower control limits use the mean ±2 sigma. Please refer to Appendix 2 for an additional example of calculating a control chart.

Upper Control Limit = data average + 2 (range average divided by 1.13)
Lower Control Limit = data average - 2 (range average divided by 1.13)

If we use Mary's decision to lose weight as an example, she may want to chart her caloric intact. She would start by keeping track of the calories consumed on a daily basis for two weeks. Figuring the averages, then calculate the upper and lower control limits. Having done all this, what do the numbers tell Mary? If she continues to monitor her calories, by plotting them on the chart she can determine if she is within the area that she has deemed appropriate for weight loss. However, if she notices days that are not within the limits, she can determine if they are a result of a change in her eating habits or special cause (i.e. Uncle Filbert's birthday party!). A general change in eating habits can then be addressed and corrected, Uncle Filbert's birthday, fortunately occurs only once a year and should not cause too much concern.

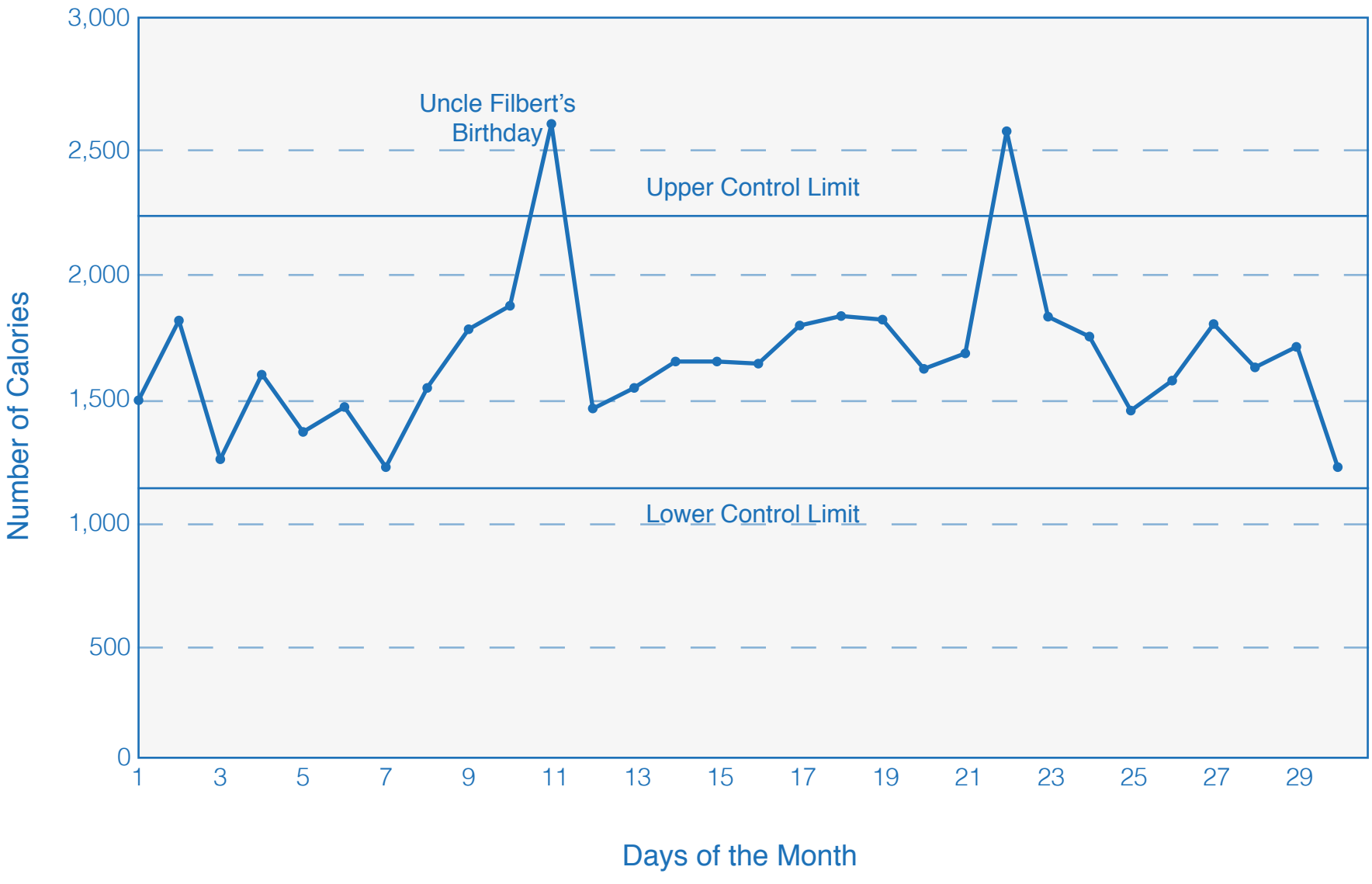
Advantages:

Creates a method in which it is easy to chart information and quickly detect if a process is out of control (outside tolerable limits).

Pitfalls:

The chart can show items that are not within tolerable limits, but does not offer suggestions at their cause or how to eliminate (control) them. Also, depending on the information being gathered, the process may not remain stable. For example, if you are charting your speed at jogging, over time your speed may change (quicker) and a re-evaluation of the chart is necessary.

Control Chart
Mary's Monthly Caloric Intake



4 Histograms

Definition:

A pictorial summary of variation in a data set.

Method:

After data has been collected over a period of time, it is plotted on a bar chart to represent the variation in performance. If Mary wants to look at her jogging performance, a histogram may be a good tool to determine which days she is running the best. By keeping track of her distance on a daily basis she can track her progress and strongest day for running. Label the "x" axis "Days of the Week" and the "y" axis "Distance Run".

Student Project:

Page 18 is an example of a histogram prepared by a student wanting to increase her level of exercise through walking. The results were posted on a histogram, clearly showing an increase in mileage walked during a 30 minutes session. Note: Sundays she did not walk February 4, 11, 18 and 25. This is "special cause variation". She could have shown the histogram for 6 days a week dropping Sunday if that is part of her plan. This data could also be presented as a run chart.

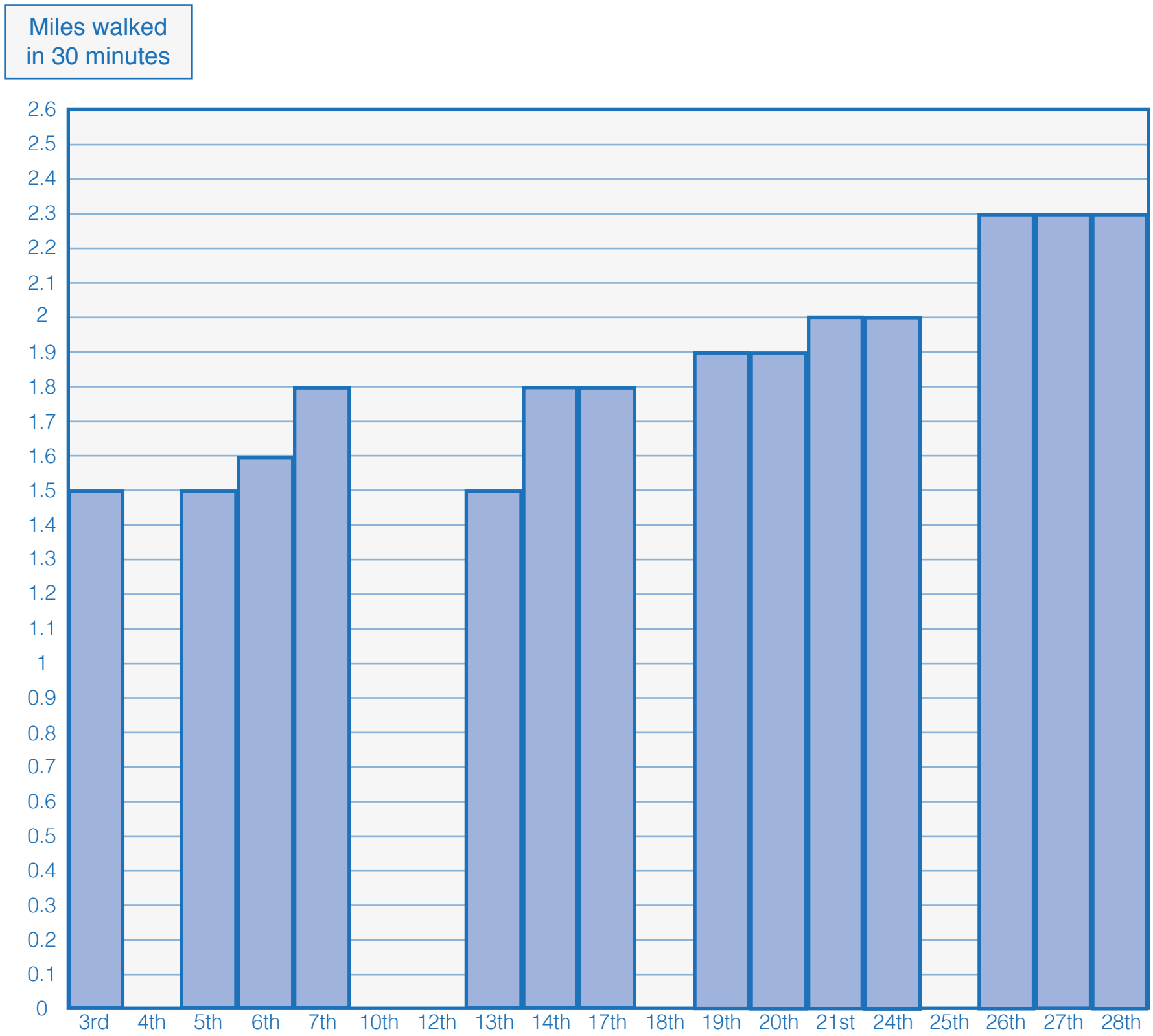
Advantages:

Data can sometimes be overwhelming, a picture may be easier and quicker to interpret. Through visual representation, a pattern can be easier to discern.

Pitfalls:

Conclusions should not be drawn on too small a sample, with a larger sample more confidence can be built into the explanation of peaks and valleys.

Walking Distance



5

Run Sheets

Definition:

A simple data recording form that has been designed to not only collect data, but readily interpret the results from the form itself.

Method:

Create a data collection sheet that will enable the operator to not only plot the information, but see the results in trend format immediately.

Mary could use this type of chart to look at her jogging times on a daily basis. The “x” axis can represent the “Days of the Week” and the “y” axis can represent “The number of minutes to run 3 miles”. Everyday after she runs she checks her time and puts a “dot” on that day/time intersection. As her times improve (hopefully), the line should slowly move down towards the “x” axis.

Student Project:

Based on data collected during a one week period, a student decided to reduce her caffeine consumption. The implementation process substituted coffee, tea or cocoa with decwaffeinated beverages. To chart her progress she prepared a check sheet. As you can see on page 20 the chart shows caffeine consumption (in milligrams) for a 28 day period. After the initial week of observation then implementing a plan, her caffeine consumption showed a marked decrease.

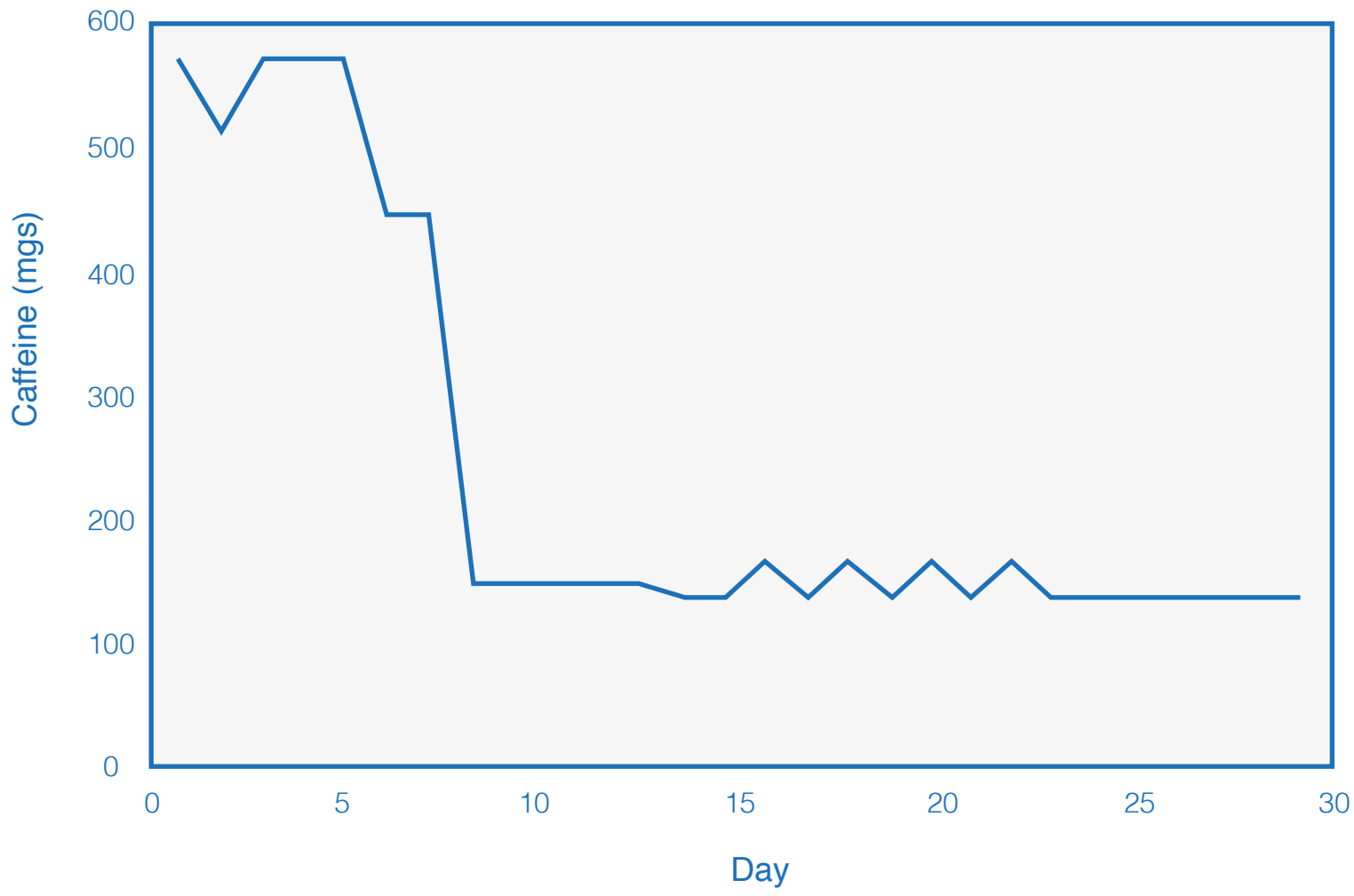
Advantages:

Quick way to chart progress.

Pitfalls:

The method does not offer any interpretation, only hard facts. When any type of data is collected, it is important to be accurate and know exactly what it is that needs to be measured/analyzed.

Run Chart
Caffeine Consumption Over Time (28 Days)



6

Pareto Charts

Definition:

A Pareto chart depicts a “maldistribution”, or a lot of problems that come from a small number. Typically, we use the breakdown of 80% of the problems come from 20% of the group.

Method:

Data is gathered on a specific function or operation. The information is plotted on a chart and organized with the most frequent cause placed on the left with subsequent stacks continuing to the right in decreasing rates.

Mary may want to keep track of reasons why she is not exercising (look at your Fishbone diagram for ideas!). With all the reasons, which is really the one that is the biggest factor? She has cited on the Fishbone four main hurdles for not exercising: (1) lack of time, (2) bad weather (3) gym closed and (4) not in the mood. Everyday she has not exercised, she puts a “tick” mark next to the reason. After several weeks of gathering information she prepares her Pareto chart. She notices that although she cited four reasons, the single most items that has caused her lack of exercise is “lack of time”. Armed with this knowledge, she can now make changes in her schedule.

Student Project:

Faced with many options, opportunities and excuses, a student was frustrated with her lack of exercise. Part of her personal improvement project included recording the number of occurances that inhibited her from exercising. After 28 days she tallied these tick marks and prepared a Pareto Chart (see page 23). Based on her chart, she realized that studying was the chief culprit.

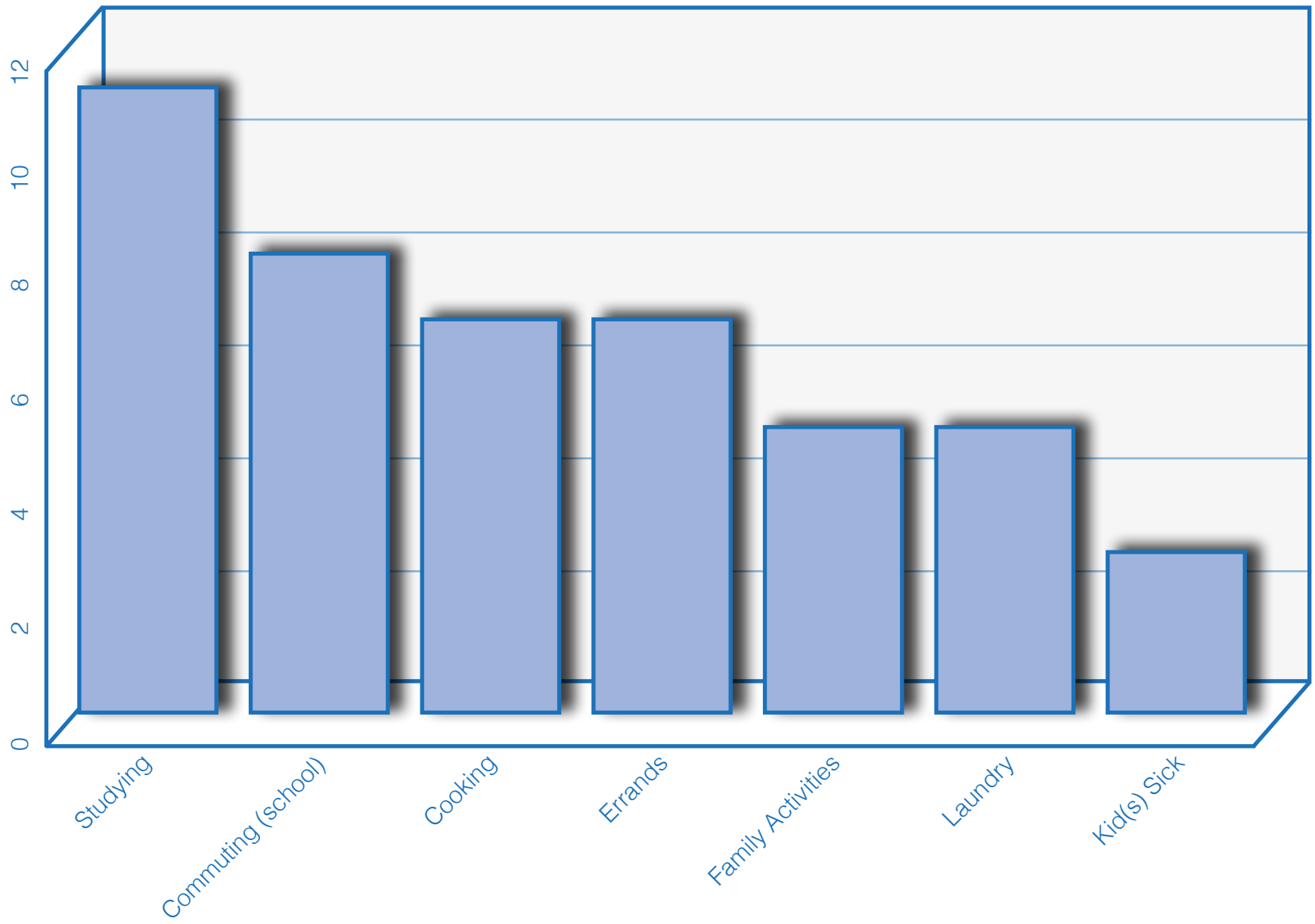
Advantages:

Helps identify the “nasty” few that really need attention, helps focus change efforts.

Pitfalls:

Too much data might not produce a clear-cut “nasty few”, so data will need to be refined for proper identification.

Pareto Chart
Top Reasons for Not Exercising



7 Scatter Diagrams

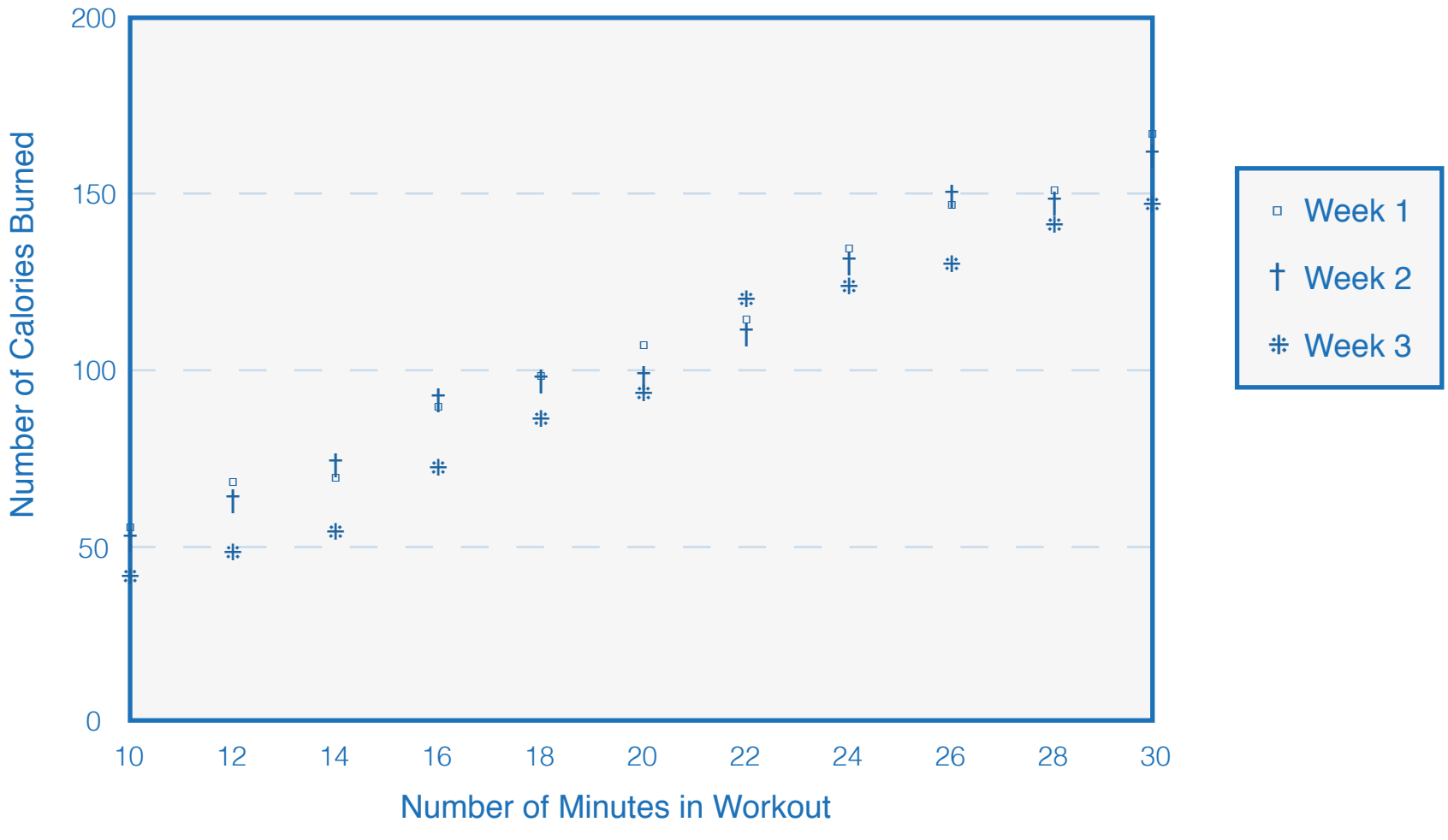
Definition: A non-mathematical method to show (visually) the relationship between two characteristics.

Method: The data is plotted on a graph, usually with the “y” axis for the characteristic we would like to predict and the “x” axis for the variable used for making the prediction.

Advantages: A method to determine quickly if there is a relationship between to characteristics.

Pitfalls: Just because two variables seem to be related, they may not necessarily be so. There may be other factors influencing the apparent relationship.

Scatter Diagram
Mary’s Minutes of Exercise/Calories Burned



Personal Improvement Projects

As you can see in this workbook, a variety of projects have been explored including:

Time Management

- Improve travel time to work or school
- Study habits (less TV watching, fewer breaks)
- Sleep habits

Nutrition

- Reduce snacking, coffee drinking
- Reduce calorie/fat intake
- Increase water intake

General Health Issues

- Exercise (walking, jogging, weight-lifting)
- Hypertension
- Reduce blood sugar levels
- Improve peak flow for asthmatics
- Reduce weight

Others that you may consider

- Personal budgeting, saving money
- Getting a job
- Reading more
- Reducing interruptions
- Creating more personal time
- Spend less on soft drinks
- More prepared meals rather take outs
- Personal stress level
- Reduce smoking Fatigue reduction
- Medication compliance

While working on your project be sure to remember key points in constructing the experiment.

1. Clearly state the improvement effort
2. Begin data collection immediately
3. Try several small PDSA cycles
4. Plot your results using one or several of the charts
5. State whether an improvement was realized
6. Create a “next-step” process

Storyboard Format

Storyboards are a communication vehicle to display your project to the public They general present the information in a standardized format facilitating understanding. There is not one “right” answer, but typically the following information should be displayed (this is the information that should be included for this project):

Your name

The Title (Area of Improvement)

What was chosen and possibly why

Indicate your PDSA cycles

Data and diagrams

Results (was an improvement realized and how was it measured?)

Next steps

Listed below are additional ideas on how to construct a storyboard:

Project Title

Your name or team members

Address

Phone numbers/e-mail

Publicly post your story board in the organization which will alert other employees that changes are being carried out. It facilitates future implementation of suggestions.

Statement of Problem

- How do you know this is a problem?
- Give bench-marking data.
- Be brief.
- Describe only one problem.

Define your problem without suggesting a solution. An example of a bad problem definition: “Information system is down too often.” A better statement might read: “Some patients wait more than 45 minutes for admission to be completed.”

Description of the process

In creating a process chart try to solicit every group members ideas separately before presenting the group with an integrated view. Get an understanding of the process but be ready to put in an entirely new process

Start with an overview chart and add details later.

Pilot Study

- Describe when the study was done.
- What was the intervention?
- How was data collected and by whom?
- How was the data analyzed?
- Who was involved?

Did it work?

- Display charts that are most appropriate for your data.

Proposed Plan & Conclusion

- Describe in detail the next steps.
- Describe the timing of the next improvement.
- Be specific. Be brief.

Appendix 1

Results to Date

Student Personal Improvement Projects have been monitored with regard to improvement tools use, improvement realized and outcomes measured. In the fall 1996 semester students completed their personal improvement projects with only general directions. In later semesters students were given the project workbook with step-by-step directions and examples. Below are the results we collected:

Fall1996 (n=17) no workbook
Spring 1997 to 1998 (n=66) with workbook

Number of Outcomes:

Measures Taken	No Workbook	With Workbooks
0	25%	0%
1 - 5	0%	15%
6 - 10	25%	9%
11 - 20	35%	15%
> 20	15%	61%
	100%	100%

Percentage of Students Using Improvement Tools:

Tool	No Workbook	With Workbooks
Flow Chart	0%	45%
Cause & Effect	0%	50%
Control Chart	0%	23%
Histogram	24%	62%
Check Sheet	47%	32%
Pareto Chart	0%	33%
Scatter Diagram	0%	17%

Students were surveyed if they felt an improvement was made:
(Percentage of students)

Response	No Workbook	With Workbook (n=65)
Not Yet	65%	9%
Not Sure	0%	2%
Unmeasured	5%	6%
Measured	30%	48%
Significant	0%	35%
	100%	100%

Students were surveyed if they would continue working on their improvement:

	Yes
No Workbook (n=17)	41%
With Workbook (n=65)	86%

Appendix 2

Control Charts

George measured the number of hours he studied each day for a week.

Day	Hours of Studying	Range
1	3.0	x
2	2.3	0.7
3	2.0	0.3
4	1.0	1.0
5	3.0	2.0
6	2.5	0.5
7	2.2	0.3

Number of Observations = 7

Mean number of hours studying, **data average** = (3+2.3+2+1+3+2.5+2.2) divided by 7 = 2.28057

Range = the difference between observations. There is no range value for the first observation. For the second day the range is the absolute difference between the observation on day one and day two. Thus 3 - 2.3 = 0.7. The range for day 2.

Range average = (0.7+0.3+1+2+0.5+0.3) divided by 6 = 0.8

Sigma is calculated by dividing the range average R (in this case 0.8) by a constant 1.13.

The two sigma upper control limit equals

The mean value ***plus*** two times the range average divided by 1.13

2.28 + 2 (0.8/1.13) = 1.146 The two sigma upper control limit

The two sigma lower control limit equals

The mean value ***minus*** two times the range average divided by 1.13

2.28 - 2 (0.8/1.13) = 0.864 The two sigma lower control limit

The upper control limit for the range = the range average multiplied by the constant 3.27 In this case (0.8)(3.27) equals 2.616
Three rules for “out of control” are:

- One point above or below the two sigma control limits
- Three points in a row above or below the one sigma control limit
- Seven points in a row above or below the average.

Note: Sometimes standard deviations are used to calculate control limits. The interested student might see Grant and Leavenworth cited in the references.

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