Case studies for statistics for quality control

TBS951: Case Studies Case Study # 2: CBC Laboratory Turnaround Time

Each CBC-TAT subgroup has 3 samples representing a snapshot of the daily process, which was measured for 23 days. The X-bar chart allows monitoring of CBC-TAT process over time, and the R chart allows monitoring the variation within the subgroup over time. The use of X-bar/R charts is adequate for this process. For subgroups with samples larger than 10, the X-bar/S chart should be used.

2) Process Control

3) Process Capability

4) The X-bar chart is used to monitor the CBC-TAT process over time. The R chart is used to monitor variation within the subgroup over time. The resulting charts from X-bar and R allow determination of process control over time.

5) X-bar and R information plotted on a chart allows monitoring of process control and determination of warning signs when some problems/errors might creep into the CBC-TAT process. Statistical evidence from the charts could be used to dispel doubts among physicians and others, or look for remedial measures if the process is out of control.

Case Study # 3: Primary Cesarian Sections

1) C-section data are counts. Counts are classified as attribute data.

2) The p-chart (see chart below) should be constructed for the C-section data, as C-section has been represented as a percentage of total cases.

n= 27; UCL= 0. 3629; Center= 0. 1543; LCL= 0

Year 2005

n= 12; UCL= 0. 4726; Center= 0. 1573; LCL= 0

Year 2006

n= 12; UCL= 0. 4675; Center= 0. 1545; LCL= 0

Year 2007

n= 3; UCL= 0. 74; Center= 0. 1416; LCL= 0

3) As none of the data points are outside the control limits, there has been no shift in the process.

4) The future C-section rate would be approximately 15. 43 percent if no changes were made in current practices.

5) Control limits look like steps if constructed separately for specific periods of time (see figures for year 2005; 2006; 2007). However, if they are constructed as a single chart over time as a continuous chart, it is a straight line. There is no problem with the computer software.

Case Study # 4: Patient Falls

1) Patient falls are counts. Counts have been classified as attribute data.

2) C-charts have been considered appropriate for monitoring the count of patient falls, relative to a constant sample size.

3) There has been a steady decline in counts within the chart after implementation of the program. Form the chart, the number of counts beyond September 2005 had the program not been implemented would have remained above the average of 51. 88. After intervention, it was approximately 37. 8.

n= 24; UCL= 62. 775; Center= 43. 083; LCL= 0.

4) If the data is segregated into two parts one before intervention, and one after intervention the program could be considered effective. However, if all the data is plottted on one chart one of the points lie above the UCL. Also, there are three consecutive points above and below the center line indicating that the process is not in control.

Before intervention

n= 9; UCL= 73. 499; Center= 51. 889; LCL= 30. 28

After intervention

n= 15; UCL= 56. 245; Center= 37. 80; LCL= 19. 35

5) The mean and control limits were frozen to determine the state of the process control after implementation of the intervention program. This allowed determination of process control effectiveness over time without any changes in the intervention program.

6) The second control chart allows comparison of the program before and after intervention. Clearly, the new chart displays lower control line indicating lower number of incidents.

CASE-Study # 5:

a) Sample size = 4; Number of Samples = 20; X-bar UCL= 8. 69; Center= 6. 16; LCL = 3. 63

R UCL = 7. 92; Center = 3. 47; LCL = 0. 0

b) The process is not in control as there is one point above the X-bar UCL, and there is another below the LCL.

c) The process of waiting times for customers at the teller during lunch hour has been studied. The process is not in control, and there is huge variability in the process. The process can be standardised for completion within a specified servicing time. Special cases that require deviation from the standard process should be referred to a specific teller for unique cases. This will allow accomplishing servicing standards.

CASE-Study # 6:

a) n= 20; p-chart UCL= 0. 1563; Center= 0. 0343; LCL= 0

b) The process is out of control as there are two points that lie below the lower control limits. A process in control would have points fluctuating above and below the center line, without going outside the control limits.

c) Possible reasons for out of control signal include accounting of clerical errors as a count, and expressing it as a proportion. The nature of clerical errors being an attribute, there could be days when the clerical errors do not occur on specific days, and repeat after intervals. In the case, no errors were observed in intervals of 10 days.