



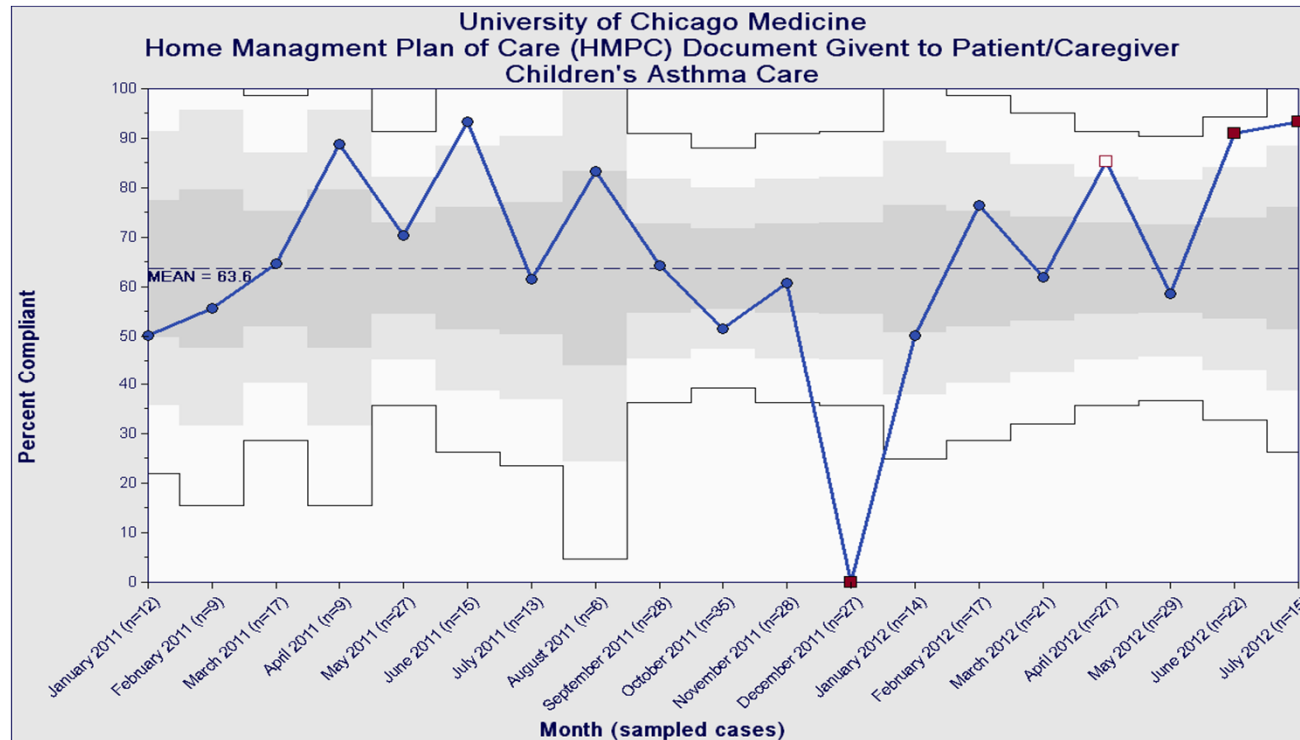
THE UNIVERSITY OF  
**CHICAGO**  
MEDICINE

## Control Charts

A way to identify meaningful changes in  
clinical data

# Control chart basics

- Red data points identify meaningful change or extremes



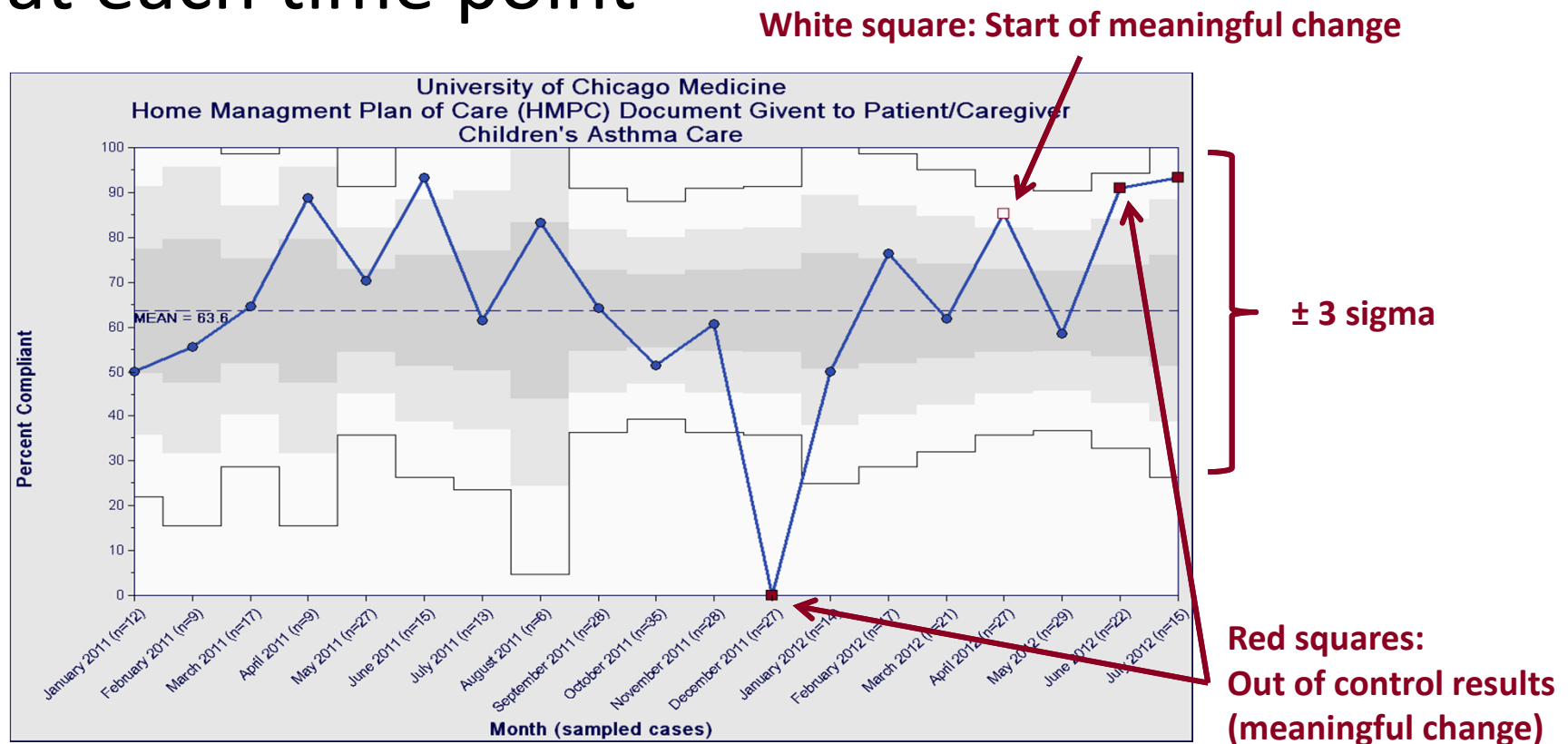
Control charts are used to identify statistically significant change by applying a standard set of rules against the 3 sigma limits. **Red square: meaningful change.** White square: contribute to change. Blue circle: no change.

# Purpose of control charts

- Complete use of control charts includes analysis of past performance and identifying whether the results are '**in control**' or not
    - **In control:** results vary over time, but are not outside of limits
    - **Out of control:** changes are extreme or outside of limits, a meaningful change occurs
  - We then respond to meaningful changes
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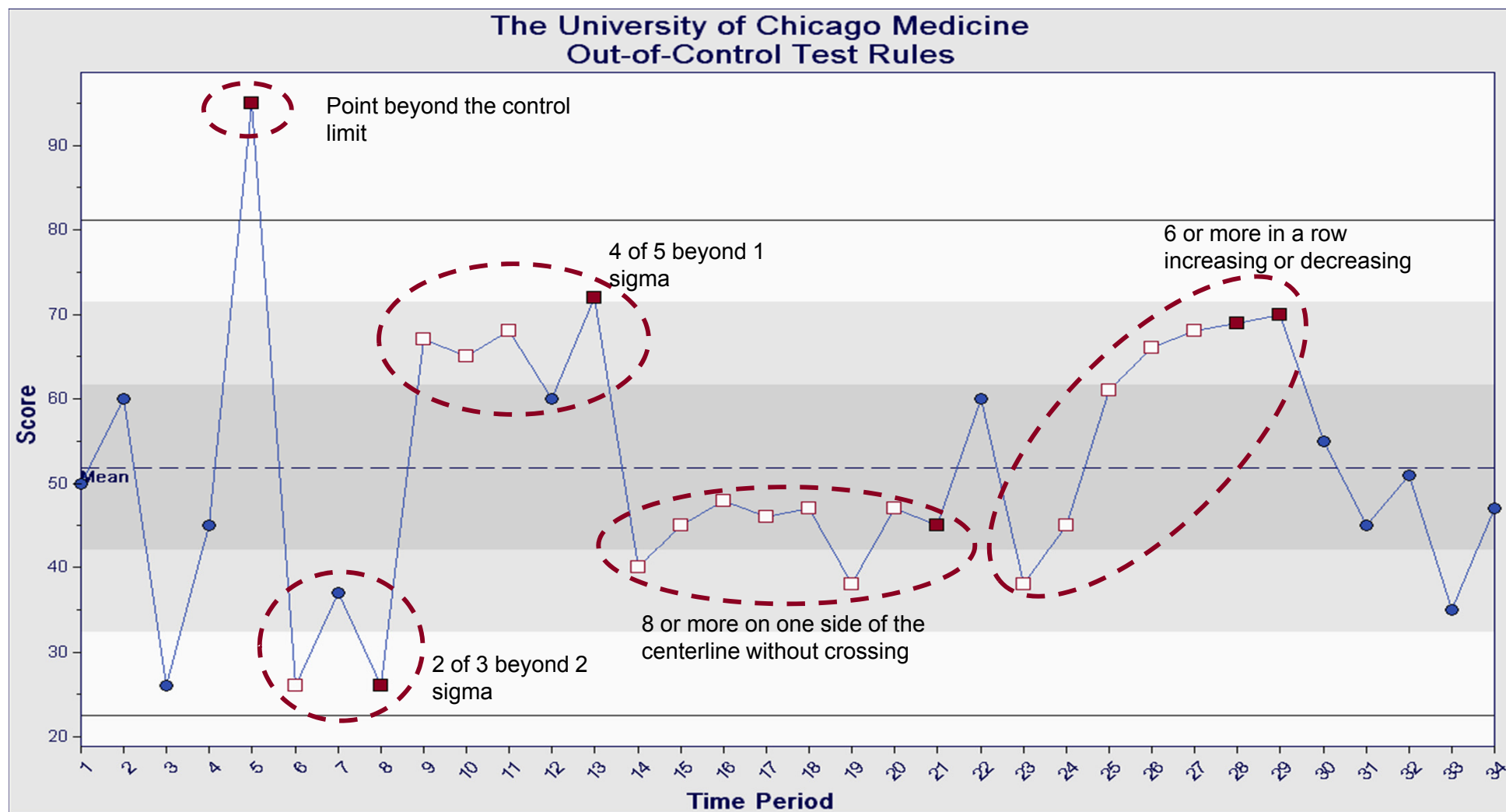
# Control chart components

- Limits are based on estimated variation (sigma) at each time point



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# Rules to determine 'out of control' results



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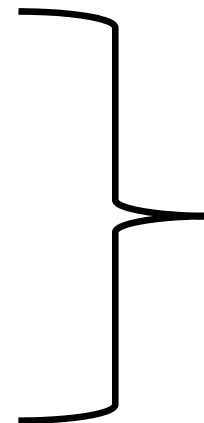
# Two types of variation

## *Common Cause Variation...*

1. No “real change”
2. Not “assignable” to any specific cause
3. Regular, random, or expected variation
4. A natural part of all processes
5. Performance remains predictable
6. **Blue data points**

## *Special Cause Variation...*

1. A real change (assignable variation)
2. Not an essential part of a process
3. Sometimes unanticipated
4. **Red data points**



This type of variation can be identified by using a control chart

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# Other related references

- Benneyan, James C., Statistical Quality Control Methods in Infection Control and Hospital Epidemiology, Part I: Introduction and Basic Theory.. Infection Control and Hospital Epidemiology, Vol. 19, No. 3 (Mar., 1998), pp. 194-214.
  - Benneyan, James C., Statistical Quality Control Methods in Infection Control and Hospital Epidemiology, Part II: Chart Use, Statistical Properties, and Research Issues. Infection Control and Hospital Epidemiology, Vol. 19, No. 4 (Apr., 1998), pp. 265-283.
  - Carey, R and Lloyd, R., Measuring Quality Improvement in Healthcare: A Guide to Statistical Control Applications, ASQ Press, Milwaukee, WI, 2003.
    - Source of out of control test rules
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