

Practical Measurement for Health Care Improvement

Edited by Brant J. Oliver, PhD, MS, MPH, PMHNP-BC, FNP-BC and
Gregory S. Ogrinc, MD, MS



Joint Commission Resources Mission

The mission of Joint Commission Resources (JCR) is to continuously improve the safety and quality of health care in the United States and in the international community through the provision of education, publications, consultation, and evaluation services.

Disclaimers

JCR educational programs and publications support, but are separate from, the accreditation activities of The Joint Commission. Attendees at Joint Commission Resources educational programs and purchasers of JCR publications receive no special consideration or treatment in, or confidential information about, the accreditation process. The inclusion of an organization name, product, or service in a JCR publication should not be construed as an endorsement of such organization, product, or service, nor is failure to include an organization name, product, or service to be construed as disapproval.

This publication is designed to provide accurate and authoritative information regarding the subject matter covered. Every attempt has been made to ensure accuracy at the time of publication; however, please note that laws, regulations, and standards are subject to change. Please also note that some of the examples in this publication are specific to the laws and regulations of the locality of the facility. The information and examples in this publication are provided with the understanding that the publisher is not engaged in providing medical, legal, or other professional advice. If any such assistance is desired, the services of a competent professional person should be sought.

© 2022 The Joint Commission

Published by Joint Commission Resources
Oakbrook Terrace, Illinois 60181 USA
<https://www.jcrinc.com>

Joint Commission Resources, Inc. (JCR), a not-for-profit affiliate of The Joint Commission, has been designated by The Joint Commission to publish publications and multimedia products. JCR reproduces and distributes these materials under license from The Joint Commission.

All rights reserved. No part of this publication may be reproduced in any form or by any means without written permission from the publisher. Requests for permission to make copies of any part of this work should be sent to permissions@jcrinc.com.

ISBN (print): 978-1-63585-306-3

ISBN (e-book): 978-1-63585-307-0

Printed in the USA

For more information about The Joint Commission, please visit <https://www.jointcommission.org>.

Development Team

Associate Director, Editorial Books and Digital

Subscriptions: Phyllis Crittenden

Associate Director, Production: Johanna Harris

Executive Director, Global Publishing: Catherine Chopp
Hinckley, MA, PhD

Reviewers

Joint Commission Division of Healthcare Improvement
Yerachmiel Ephraim, MBA, LSSMBB, Associate Director,
Diversity, Equity, and Inclusion, Office of Quality &
Patient Safety

Joint Commission Division of Healthcare Quality Evaluation
Michelle Dardis, MSN, MBA, RN, Director,
Department of Quality Measurement
Stephen Schmaltz, MPH, PhD, Associate Director,
Sr. Biostatistician, Department of Research
Scott Williams, PsyD, Director, Department of Research

Joint Commission Resources

Klaus Nether, D.H.Sc, MMI, MT (ASCP) SV,
Executive Director, High Reliability Product Delivery,
Division of High Reliability

Joint Commission International

Kathryn K. Leonhardt, MD, MPH, CPHQ, CPPS,
Principal Consultant, International Quality &
Patient Safety

Table of Contents

Dedications	vi
Foreword	vii
Introduction	ix
About the Editors.....	xi
About the Authors	xii
Chapter 1: The Hourglass Model for Practical Improvement Measurement	1
Challenges of Measurement in Health Care	3
The Hourglass Model for Practical Improvement Measurement	5
Measurement for the Improvement of Health and Health Care	8
Chapter 2: Before Measurement Begins	10
What to Expect in This Chapter	10
Rationale.....	12
Context.....	15
Scope, Scale, and Equity Considerations	19
Informatics in Improvement Measurement.....	21
Take Home Points	23
Chapter 3: Words Before Numbers: Developing Measurement Definitions and a Data Collection Plan	25
What to Expect in This Chapter	26
The Inverted Triangle Approach.....	28
Types of Measures	32
Concept-Forward Design.....	35
The 5 <i>Questions</i> Data Collection Plan	38
Take Home Points	42
Chapter 4: Developing a Data Analysis Plan	44
What to Expect in This Chapter	45
Developing a Data Analysis Plan.....	46
Step 1: Refine the Data Analysis Plan with Data Operationalization	47
Step 2: Specify Data Attributes and Sources.....	49
Step 3: Prioritize Your Data Collection Plan.....	50
The Data Analysis Plan	50
The Data Visualization Plan.....	55
Application of Concepts.....	57
Take Home Points	59

Chapter 5: Improvement Measurement Using Run Charts	63
What to Expect in This Chapter	64
Developing Your Improvement Data Strategy.....	65
Turning the First Data Point into Analysis over Time	68
The Big 3 Approach to Assessment.....	71
Take Home Points	76
Chapter 6: Statistical Process Control for Continuous Data	77
What to Expect in This Chapter	78
Introduction to Statistical Process Control.....	78
SPC Chart Analysis: The Big 3 Approach.....	79
Preparing Your Data	86
Choosing the Right SPC Chart for Your Data	86
SPC Charts for Continuous Data.....	88
Take Home Points	97
Chapter 7: Statistical Process Control for Attribute Data	98
What to Expect in This Chapter	99
SPC Analyses for Attribute Data.....	99
SPC for Dichotomous Data (np- and p-Charts).....	101
SPC for Counts Data (c-Charts and u-Charts).....	106
Cross-Sectional SPC for Attribute Data	110
Take Home Points	113
Chapter 8: Statistical Process Control for the Analysis of Rare and Infrequent Events	114
What to Expect in This Chapter	116
Framing an Analysis of Rare and Infrequent Events.....	117
SPC Approaches for Rare Events Analysis.....	124
Take Home Points	131
Chapter 9: Advanced Statistical Process Control Methods for Special Situations	133
What to Expect in This Chapter	134
Revised SPC Analyses: Fixed Limits and Split Limits.....	135
Reducing Hospital Transfer Times Using Split-Limits Analysis.....	138
Reducing Unwarranted Transfers Using Fixed- and Split-Limits Analysis	139
Other Advanced SPC Analysis Methods.....	143
Moving Average Statistical Process Control (MA-SPC)	148
Cumulative Sum (CuSum)	150
The Risk-Adjusted Sequential Probability Ratio Test (RA-SPRT)	153
Research Designs in Improvement and Implementation Research	154
Take Home Points	155
Chapter 10: Disseminating Improvement Results	157
What to Expect in This Chapter	159
The Benefits of Disseminating Improvement Work.....	159

Planning Dissemination.....	160
Sharing Data Before Work Is Completed	162
Disseminating Results After Completion.....	163
Take Home Points	167
Appendix: Detail and Discussions on Advanced SPC Methods	168
What to Expect in This Appendix.....	169
Section 1: Central Line–Associated Bloodstream Infections (CLABSIs) Using Fixed-Limits Analysis	169
Hospital Length of Stay (Split-Limits Analysis).....	172
Section 2: The Risk-Adjusted Sequential Probability Ratio Test (RA-SPRT).....	173
Section 3: R Programming Code for RA-CuSum and RA-SPRT Charts.....	177
Afterword	180
Glossary	182
Index	189