

**How to Submit a Medical Book Proposal**

**A Guide for Authors/Editors**

Cambridge University Press (CUP) is pleased to consider new proposals for print and/or digital books in Medicine. Please find below guidelines which will assist you in the development of your proposal to ensure that the reviewers have the information they require to provide a full evaluation. You should feel free to add any additional information which you think will enhance your proposal. If you have any questions, please do not hesitate to contact me (my full contact details are listed at the end of this document).

**The Proposal**

1. **Title**: Mastering statistical process control for healthcare - a practical, hands-on, step-by-step guide for data scientists using R
2. **Author(s)/Editor(s) and Affiliations -** please add your details in full including a brief overview of your background and teaching, writing, and book publishing experience.

Jacob Anhøj is a medical doctor with 30+ years of experience along with a diploma in Information Technology. He has published 45+ papers and two books and has extensive teaching experience. His main professional interest is patient safety and healthcare quality in general and statistical methods for quality improvement in particular. He has contributed to the development of statistical methods for testing for non-random variation in time series data. He is an experienced R user and has published several R packages including qicharts2 for construction and analysis of statistical process control charts.

Mohammed Amin Mohammed is Emeritus Professor of Healthcare Quality and Effectiveness at the Faculty of Health Studies, University of Bradford, and Principal Consultant at the Strategy Unit. He has 100+ peer-reviewed publications, including a landmark paper in the Lancet introducing SPC to healthcare (2001) and author of the “[Statistical Process Control: Elements of Improving Quality and Safety in Healthcare](https://www.cambridge.org/core/elements/statistical-process-control/60B6025BF62017A9A203960A9E223C10) (2024)” by CUP. He founded the NHS-R Community which promotes the use of R in healthcare.

1. **Brief Description** - please summarise your book idea in a few paragraphs. Your summary should include a description of the work, its content, scope, approach, and rationale. You should consider the following questions: why is this work needed and what purpose will it serve? Who will be the main audience and how will they use this book?

We see our book as a companion to the current [Element on Statistical Process Control](https://www.cambridge.org/core/elements/statistical-process-control/60B6025BF62017A9A203960A9E223C10). From the editorial team - "It has currently had 2677 full text views online, making it one of the most popular Elements we have published (see link to the metrics page here: Statistical Process Control (cambridge.org)). We’re really pleased with the response on social media, too – you can see activity from X (Twitter) here: Altmetric – Statistical Process Control."

This book is about the practical application of statistical process control (SPC) methodology in healthcare. SPC is based on a fundamental intuitive insight – that processes are subject to two sources of variation: common cause and special cause variation. This simple yet profound insight enables us to monitor, understand, and improve a wide range of processes.

With this insight comes a set of intuitive visual tools, run and control charts, that make it easy to distinguish common from special cause variation. Nevertheless, a systematic review concluded: “… although SPC charts may be easy to use even for patients, clinicians or managers without extensive SPC training, they may not be equally simple to *construct correctly*. To apply SPC is, paradoxically, both simple and difficult at the same time.” ([Thor et al. 2007](https://anhoej.github.io/spc4hc/preface.html" \l "ref-thor2007))

Consequently, this book aims to ease the construction and production of SPC charts in healthcare using modern software.

So, what is different about this book?

This book is a how to easily produce SPC charts book. Since this involves statistics, computing, and visualisation our software of choice is R – which is often referred to as the lingua franca of statistical computing and visualisation.

This book stands out by being a specialized, practical, and modern guide specifically tailored for data scientists in the healthcare sector. Its focus on real-world application, combined with comprehensive coverage of SPC techniques and the use of contemporary tools, makes it a unique and valuable resource.

Target Audience: This book aims to help people who want to produce SPC charts in practice using modern software. This book is specifically tailored for data scientists who want to learn how to produce SPC charts using the R programming language. We refer to such people as data scientist whilst recognising that they may be analysts, practitioners, managers, teachers, students, researchers, clinicians or patients.

Use of R: Our choice of software is R, which is popular, free, and open source. By being pro-R we are not anti any other software. Indeed, we encourage readers to use this book with their preferred software and share it with the world. One major advantage of R (and programming languages in general) is that all the steps and procedures involved in analysing data and constructing graphs and other output are documented in readable form in the source code thus making analyses transparent and reproducible, which is rarely the case with “point-and-click” software. Another advantage of R is that it enables the automation of repeated tasks such as monthly reports, slide decks and dashboards of SPC charts with high quality customisable graphics.

Healthcare Focus: While there are many general books on SPC, this book’s focus is on practical applications in healthcare, making it particularly relevant for those working in this field. It addresses the unique challenges and requirements of applying SPC methods in healthcare settings, such as patient safety, clinical outcomes, and operational efficiency as described in an accompanying book (Mohammed 2024).

Practical Guide: The book is a practical step-by-step guide, using real-world examples and case studies that enable readers to produce and use SPC charts with confidence. This hands-on approach helps bridge the gap between theory and practice.

Comprehensive Coverage: The book covers a comprehensive range of topics within SPC, from basic concepts to advanced techniques. This ensures that both beginners and experienced data scientists can find valuable insights and techniques that can be applied to their work in healthcare.

Resources: The book comes with additional resources such as R scripts, datasets, and access to an online GitHub repository.

1. **Key Features and Benefits** - please list at least three key featuresof your book idea and explain how each feature will benefit the reader. It would be helpful if you can consider what will make your book stand out from the competitors.

|  |  |
| --- | --- |
| Features | Benefits |
| Focus is on the practical production of SPC charts for healthcare | We assume no prior knowledge about SPC. We offer step by step methods on the production of SPC charts using examples from healthcare. |
| We adopt modern open-source software – R because its use in healthcare is rapidly growing | This allows production of SPC charts at scale, which in a typical hospital can involve thousands of charts every day. |
| We provide important practical tips on dealing with real world issues | For example, when faced with different sets of rules for determining special cause variation, which rule set is better suited to healthcare. |
| We emphasize the usefulness of the run chart which in practice is underutilized. | The run chart is easy to construct and can accommodate wide range of data and provide good performance using an appropriate set of rules. |
| We examine advanced topics which are relevant to SPC in healthcare | For example, cumulative sum charts, combined use of measurement and attribute charts. |

1. **Outline and Table of Contents** - please provide a full contents list for the book including chapter headings and sub-headings and if possible, a brief summary of the content that will be covered in each chapter. For an edited book, please include the names and affiliations of your *proposed* contributors (you do not need to invite the contributors at this proposal stage - they should represent your ‘wish list’).

The book is currently under development. The current version is available at our GitHub site: https://anhoej.github.io/spc4hc/

## Synopsis

## Introduction

1. What is SPC?
2. Preface
3. Synopsis

## Part 1: Understanding Variation

1. Understanding Variation
2. Understanding SPC Charts
3. Looking for Signals
4. Charts Without Borders – using runs analysis as stand-alone rules with run charts
5. Using SPC in Healthcare

## Part 2: Constructing SPC Charts with R

1. Your First SPC Charts with Base R
2. Calculating Control Limits
3. Highlighting Freaks, Shifts, and Trends
4. Core R Functions to Construct SPC Charts
5. SPC Charts with ggplot2
6. Introducing qicharts2

## Part 3: Case Studies and Worked Examples

1. Case 1
2. Case 2
3. Case 3

## Part 4: Advanced SPC Techniques

1. Funnel Plots for Categorical Subgroups
2. Pareto Charts for Ranking Problems
3. SPC Charts for Rare Events
   * T Charts for Time Between Events
   * G Charts for Opportunities Between Cases
   * Bernoulli CUSUM charts for binary data
4. Prime Charts for Count Data with Very Large Sample Sizes
5. Screened I Chart (eliminating freak moving ranges before calculating limits)
6. Improved (normalised) I chart
7. Improved Runs Analysis Using the Bestbox and Cutbox approaches
8. CUSUM and EWMA Charts
9. Dual charting
10. When to Transform Data Before Plotting
11. High Volume Data
12. Scaling Up Charts (technical issues, tabular charts, grids)
13. Multivariate charts

## Part 5: Best Practices and Tips

1. Tips for Effective SPC Implementation
   * Automating production of SPC charts
   * Engaging stakeholders
   * Continuous monitoring and improvement.
   * Problems with SPC (challenges)
2. Common Pitfalls to Avoid
   * Data issues, misinterpretation of charts
   * Overreacting to common cause variation (over-sensitive runs rules, too tight control limits)
   * Automating recalculation of control limits
   * One-to-one relation between PDSA cycles and dots on the plot
3. A Note on Rational Subgrouping and Sampling

## Part 6: Conclusion and Final Thoughts

1. Summary of Key Points
2. The Control Charts vs Run Charts Debate
3. Emerging trends in SPC and healthcare analytics
4. Encouragement for Continuous Learning and Application
5. Final Thoughts

## Appendices

1. Included Data Sets
2. Basic Statistical Concepts
3. Diagnostic Properties of SPC Charts (Two Types of Errors When Using SPC)
4. Introducing R
5. Table of Critical Values for Longest Runs and Number of Crossings
6. Resources and Further Readings
7. Glossary of Terms
8. **Digital plans** - if appropriate, please include any information about digital plans for your book such as online ancillaries (e.g. additional online-only images; videos; animations etc.) and online updating requirements, if any. Please note that the majority of our books are made available as eBooks via third party suppliers and are available online via our platform, Cambridge Core.

We propose a free e-book version and a paid paper copy. We have a dedicated github repository which will include supporting materials and updates.

1. **Parameters** – please provide information about what the final print product should look like:
   1. **Approximate number of words (if you are estimating pages – are you using Word? And if so, what’s the average number of words per page? It’s easier for us to make an estimation of final overall page number if you can make an estimation of word count)**: 300 to 400 pages
   2. **Approximate number of images / illustrations (and will images/illustrations need to be in colour? If so, how many as a percentage of the estimated total?)**: 100 images (none in colour)
   3. **Suggested binding** (paperback / hardback / spiral / other – please detail why you might suggest a certain binding): spiral binding as we see the book as a desk reference
   4. **Suggested price**: £40-£50
   5. **Pedagogical features** (if any):
2. **Sample Material** – if requested, please provide some sample material which will help the reviewers gain a better sense as to how your book will be written. – the current version of book can be seen here https://anhoej.github.io/spc4hc/
3. **Timeframe** – when do you hope to deliver the final manuscript to CUP? 12 months (Sep 2025)

**The Market**

1. **Market(s) / Readership / Users** – who will be the primary audience(s) for your book and why? Will there be secondary markets? Geographically, where do you expect your book to sell? Will your book be suitable for courses and if so, which ones and at what levels? Do you expect the book to be adopted?

We see our book as a companion to the current [Element on Statistical Process Control](https://www.cambridge.org/core/elements/statistical-process-control/60B6025BF62017A9A203960A9E223C10) which presents the case for SPC in healthcare but does not provide the details for producing SPC charts in practice. The rise of SPC in healthcare has been spectacular - the number of papers relating to SPC in the pubmed database went from only 14 in 1971 to 3252 in 2023.

Healthcare attracts a considerable of portion of GDP.  In the English NHS, there are about 15000 healthcare analysts and several thousand clinical data scientists. We have links with healthcare data analysts in Europe, Canada, USA and Australia.

This is our core target audience. We are both well placed to promote the book through the NHS-R Community and other healthcare networks that we have. Nearly all universities offer healthcare related courses - where data analysis is a feature and so the book will appeal to undergraduate and postgraduate courses especially as R already used in academia. We expect our book to become the standard reference for university courses on healthcare data science especially as we offer a free online version using R.

1. **Competition** – which books/digital products do you consider to be the main competitors and why? How will your work compare and what will it offer over and above the competition?

We see one major text on SPC in healthcare from Wiley - <https://www.wiley.com/en-us/The+Health+Care+Data+Guide%3A+Learning+from+Data+for+Improvement%2C+2nd+Edition-p-9781119690139> - The Health Care Data Guide: Learning from Data for Improvement, 2nd Edition

It is a well-respected desk reference, quite expensive (~$100)

It lacks a focus on modern approaches to SPC using modern software

It does not address taking SPC into production in healthcare by automating the production of SPC charts

It is 656 pages (too long for most practitioners)

Our book will address the above limitations.

1. **Special Sale Opportunities** – do you know of any outlets which might be interested in buying multiple copies of your book idea? This could be a pharmaceutical company, NGO or society, a business, a branch of government or a local bookshop.

We have good links with the NHS-R Community and regularly attend their annual conference which has an international audience. We also attend R in medicine conference. We also attend the Health and Care Analytics (HACA) conference. In the UK, it is estimated that there are 15000 healthcare analysts and several thousand medical/clinical data scientist, who this book is targeted at. We propose to promote hard copy version of the book at these conferences along with a free workshop on SPC in healthcare based on our book. We have already delivered such hands-on workshops over decades now with excellent feedback.

**The Review and Approval Process**

For your information, the peer review process normally takes about 3 - 4 weeks. You will have the opportunity to comment on the anonymised reviews and say what you do/don't agree with and how you will amend the proposal accordingly. Assuming that the reviews are generally positive, I will present the idea to my colleagues at Publishing Committee. With their approval, the idea will be presented to the Press Syndicate and, with their go-ahead, I will be in a position to offer you a contract.

Please note that by submitting your proposal to CUP, you are agreeing to the above peer review process.

**My Contact Details**

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