The interpretation and use of healthcare performance data

Data Driven Leadership

FPKS Seminar

13th June 2017

Dr Tom Woodcock

Collaboration for Leadership in Applied Health Research and Care (CLAHRC) Northwest London

- Translate research evidence into practice…

- …to improve patient care, outcomes and experience

- Conduct world class research in improvement science

- Build capacity and capability for improvement

- Attract funding and industry partnerships

- Partnership between healthcare and academia

- Over 25 partner healthcare organisations

ORIGINAL RESEARCH

Considering chance in quality and safety performance measures: an analysis of performance reports by boards in English NHS trusts

Kelly Ann Schmidtke,[1] Alan J Poots,[2] Juan Carpio,[1] Ivo Vlaev,[1] Ngianga-Bakwin Kandala,[3,4] Richard J Lilford[5]

Methods Thirty English NHS trusts were selected at random and their board papers retrieved. Charts depicting quality and safety were identified. Categorical discriminations were then performed to document the methods used to present quality and safety data in board papers, with particular attention given to whether and how the charts depicted the role of chance, that is, by including control lines or error bars.

Results Thirty board papers, containing a total of 1488 charts, were sampled. Only 88 (6%) of these charts depicted the role of chance, and only 17 of the 30 board papers included any charts depicting the role of chance. Of the 88 charts that attempted to represent the role of chance, 16 included error bars and 72 included control lines. Only 6 (8%) of the 72 control charts indicated where the control lines had been set (eg, 2 vs 3 SDs).

Measurement for Improvement: Theory and Practice

Enumerative vs Analytic Study

On Probability As a Basis For Action,

W E Deming, The American Statistician, Vol. 29 No. 4 1975, pp. 146-152

Analytical studies: a framework for quality improvement design and analysis,

Lloyd P Provost BMJ Qual Saf 2011; 20 (Suppl. 1) doi:10.1136/bmjqs.2011.051557

"Because of the temporal nature of improvement, the theory and methods for analytical studies are a critical component of the science of improvement."

There is a simple criterion by which to distinguish between enumerative and analytic studies. A 100 per cent sample of the frame provides the complete answer to the question posed for an enumerative problem, subject of course to the limitations of the method of investigation. In contrast, a 100 per cent sample of a group of patients, or of a section of land, or of last week's product, industrial or agricultural, is still inconclusive in an analytic problem. This point, though fundamental in statistical information for business, has escaped many writers.

The 3 reasons for measurement

Characteristic	Research	Improvement
Aim	New knowledge	Improvement of service
Testing Strategy	One large test	Sequential tests
Sample Size	"Just in case" data	"Just enough" data, small sequential samples
Type of hypothesis	Fixed hypothesis	Hypothesis is flexible, changes as learning takes place
Variation (Bias)	Design to eliminate unwanted variation	Accept consistent variation
Determining if a change is an improvement	Statistical tests (t-test, chi square), p-values	Run charts, Shewhart control charts

Source: Solberg et al 1997

But…

**Improving the Quality of Quality Improvement Projects**

The Joint Commission Journal on Quality and Patient Safety, October 2010 Volume 36 Number 10, p468. Berenholtz, Needham, Lubomski, Goeschel, Pronovost.

"**Case Example**

At a recent patient safety meeting, the presenter suggested that a QI intervention in the presenter's health system improved compliance with appropriate prophylaxis for deep venous thrombosis/pulmonary embolism (DVT/PE), reduced the incidence of DVT/PE, and, consequently, reduced patient complications and saved lives. […]

When an audience member questioned the validity of the results, the presenter clarified that the data were for 'quality improvement' not 'research,' **implying […] that QI projects are exempt from the rigorous methodological standards required of other research projects**. In our experience, such views are widely promulgated among QI practitioners. … "

How is it supposed to work?

Adapted from a slide by Mike Davidge
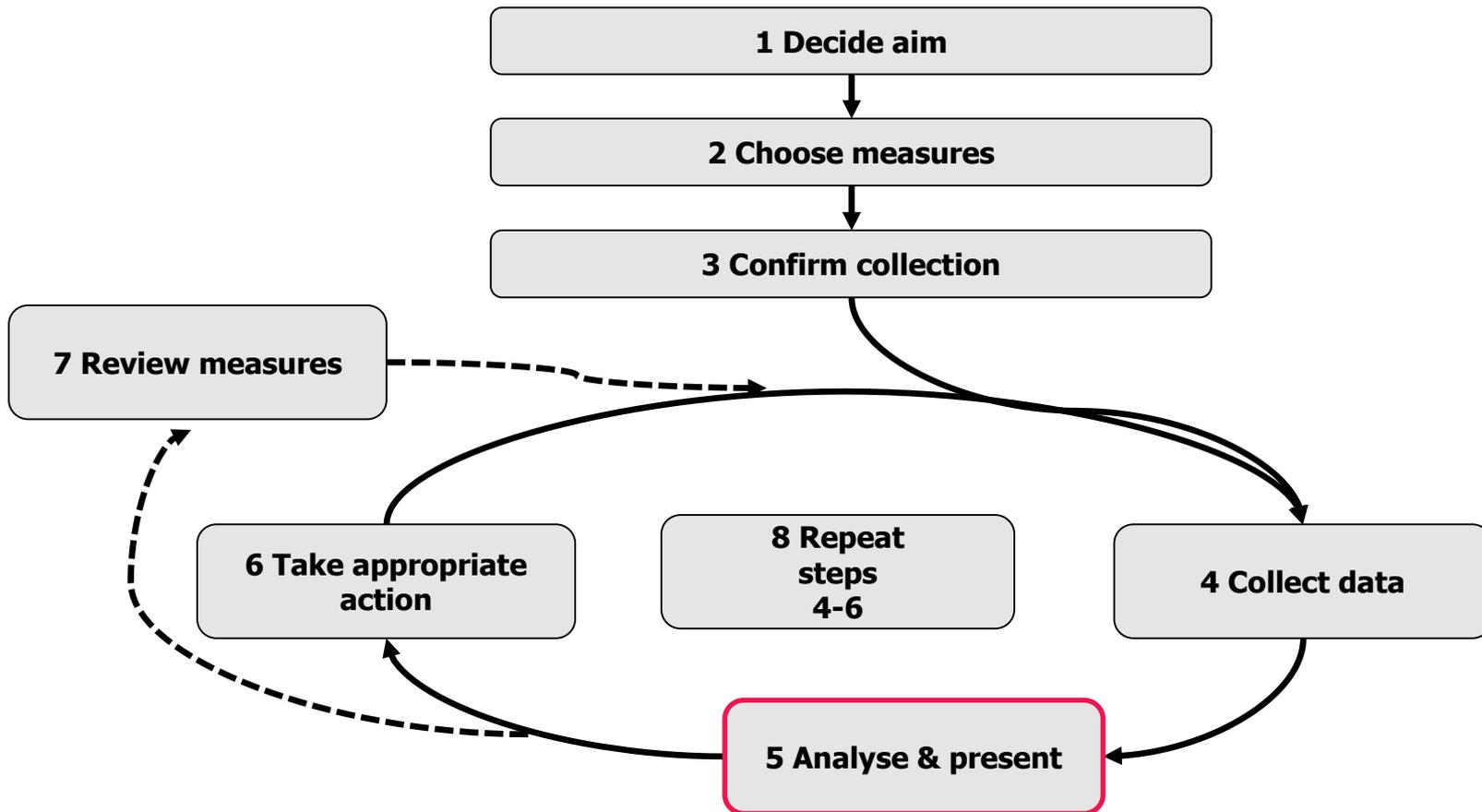
Example: Unscheduled Care Flow

Weekly percentage admissions through ED with time in department < 4h
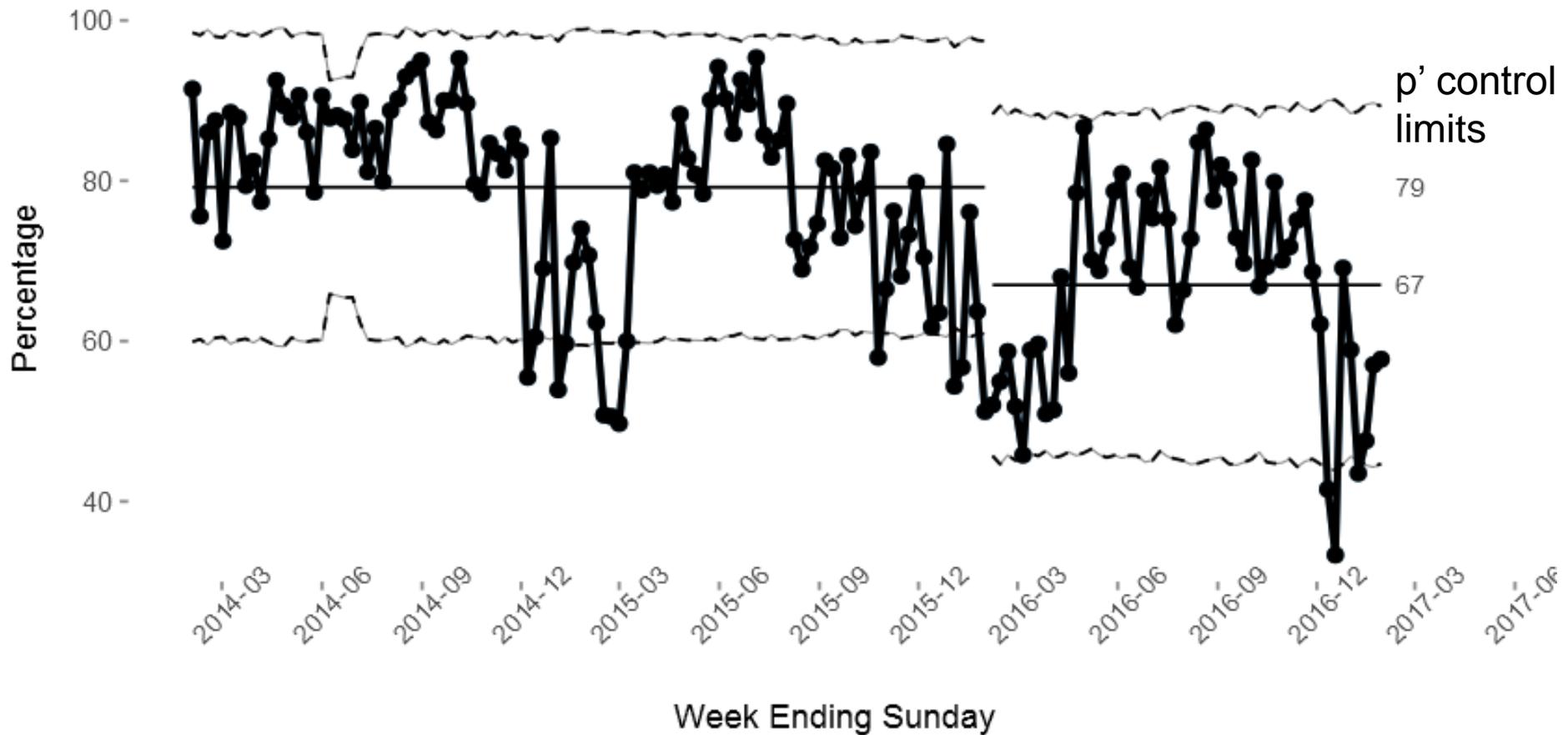
Some (common?) problems…

- Not knowing why we are measuring

  Theory, engagement,…

- Measuring wrong/too many/too few things

- The denominator problem

  Registries, definitions,…
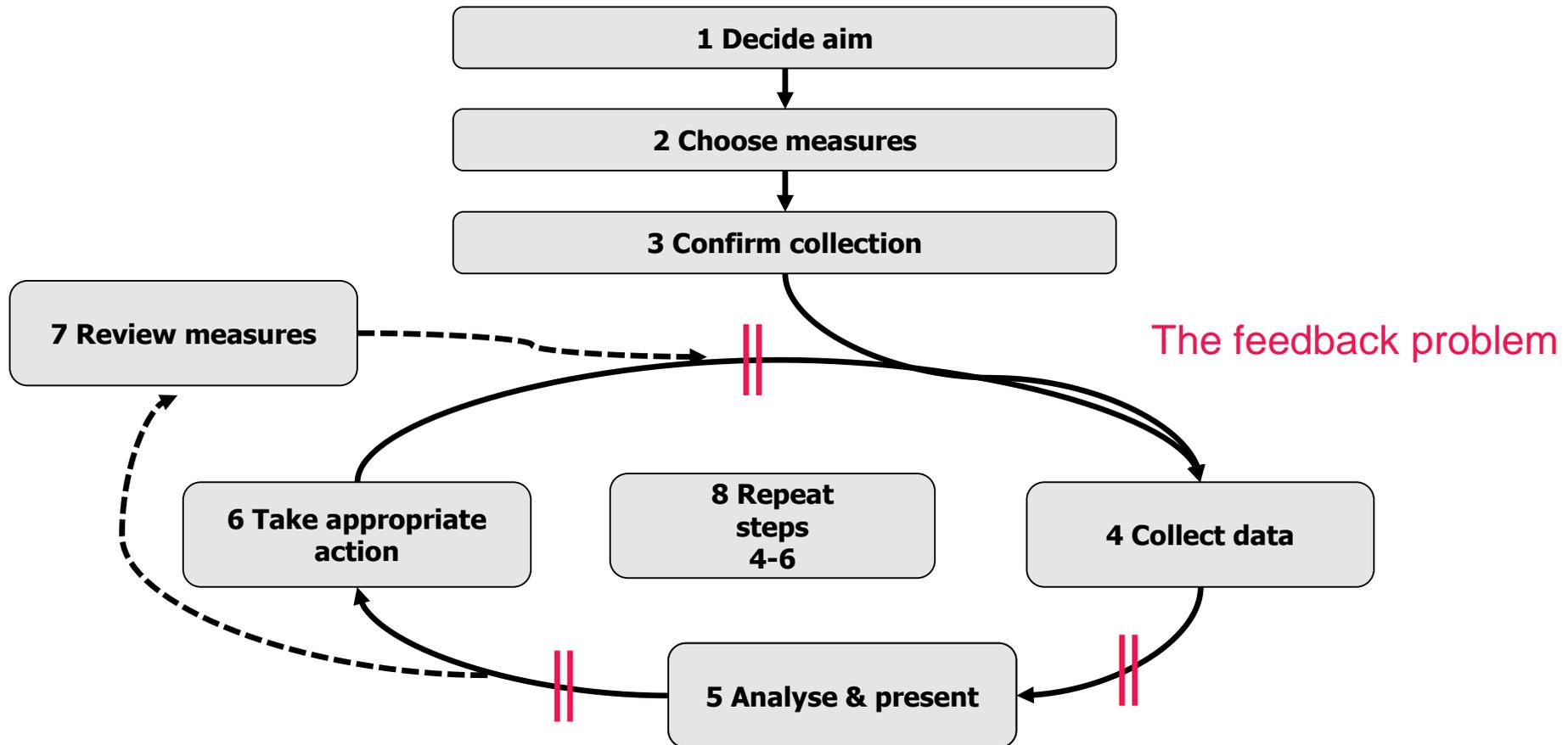
- The baseline problem

  Effective planning

- The feedback problem

- The rule-hacking problem

  ?

- The reporting problem

- The methodology problem

How is it supposed to work?

1 Decide aim

2 Choose measures

3 Confirm collection

7 Review measures

The feedback problem

6 Take appropriate action

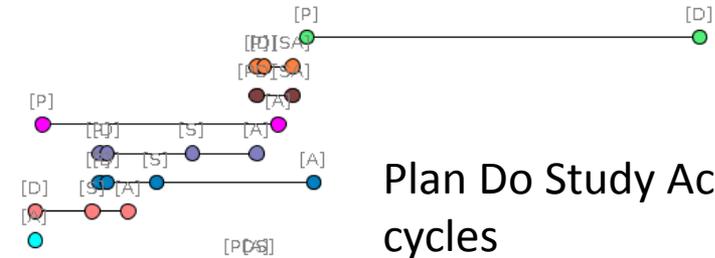8 Repeat steps 4-6

4 Collect data

5 Analyse & present

Web Improvement Support for Healthcare

Journal of Biomedical Informatics

Volume 52, December 2014, Pages 151–162

Special Section: Methods in Clinical Research Informatics

ELSEVIER

Model-driven approach to data collection and reporting for quality improvement

Vasa Curcin[a], Thomas Woodcock[b], Alan J. Poots[b], Azeem Majeed[a], Derek Bell[b]

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doi:10.1016/j.jbi.2014.04.014

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Highlights

- Addressing the challenge of the second translational gap is key to improving healthcare processes.
- Data-driven methodologies improve likelihood of success.
- We propose the Improvement Data Model (IDM) for data collection and reporting for local improvement.
- WISH, a prototype software tool based on IDM is used by over 600 users in 50+ improvement projects.

Plan Do Study Act cycles

Comments - context

Quantitative measure and SPC
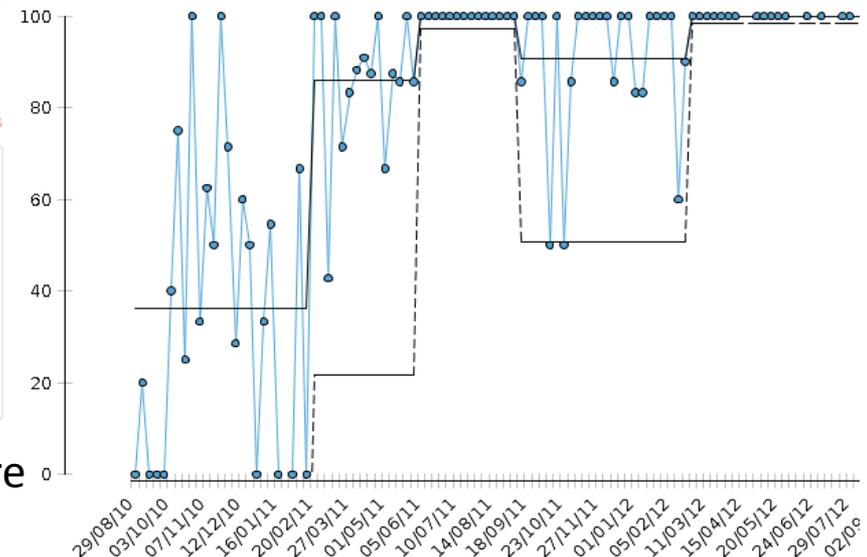
The baseline-hacking problem
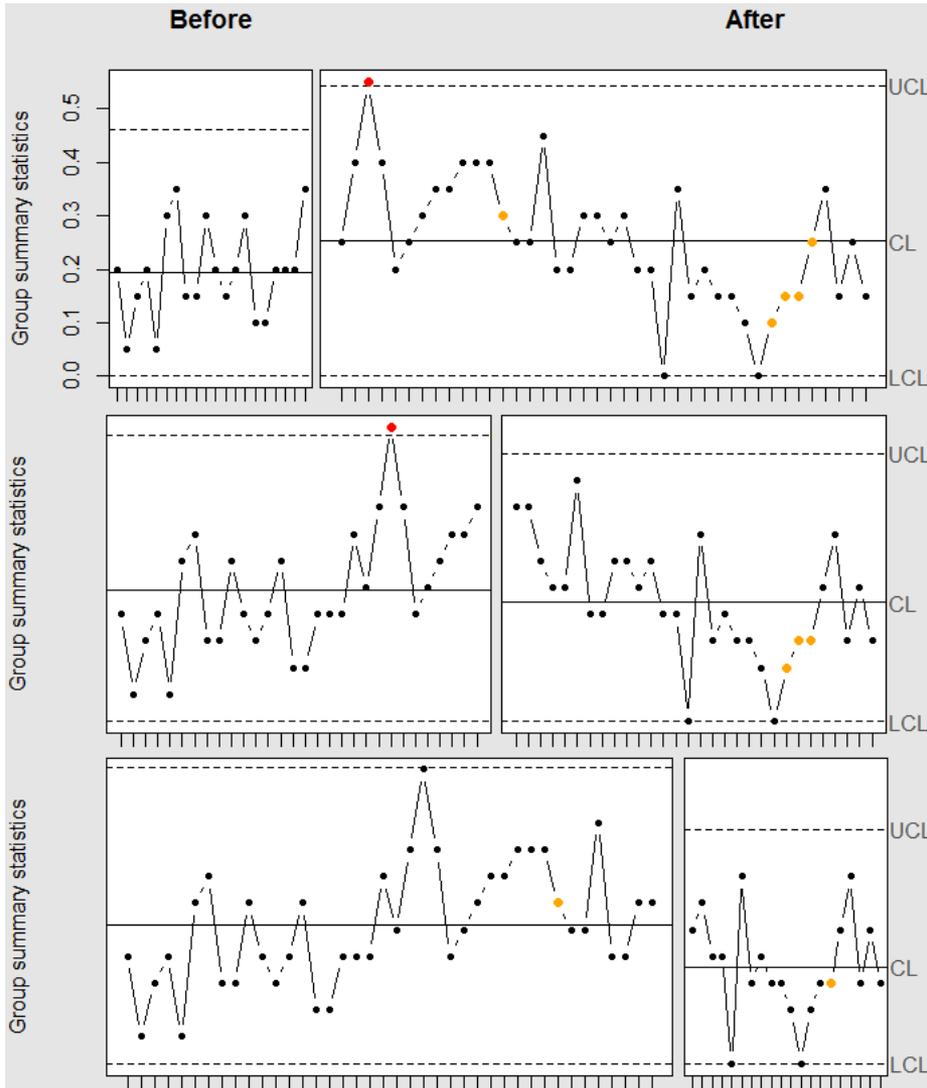
Another approach?

- Fix a minimum baseline period in advance of making any changes

- Decide and fix on rule-based criteria for starting a new "period" – 8 points in a row + identified special cause + no reverting 8 point rule-break

- Collect data for that baseline

- IF the pre-agreed criteria are met at some point after the end of the baseline; start new period

The rule-hacking problem

"Non-random patterns (special cause variation) were determined according to standard definitions (see bmj.com)."**[citation]**

Cited article:

"[…] Several other tests can also detect signals of special cause variation based on patterns of data points occurring within the control limits.8–11 Although there is disagreement about some of the guidelines, three rules are widely recommended:

- **A run of eight (some prefer seven)** or more points on one side of the centre line.

- Two out of three consecutive points appearing beyond 2 SD on the same side of the centre line (ie, two-thirds of the way towards the control limits).

- **A run of eight (some prefer seven)** or more points all trending up or down.

Lee and McGreevey recommended the first rule and the trend rule with **six** consecutive points either all increasing or all decreasing."

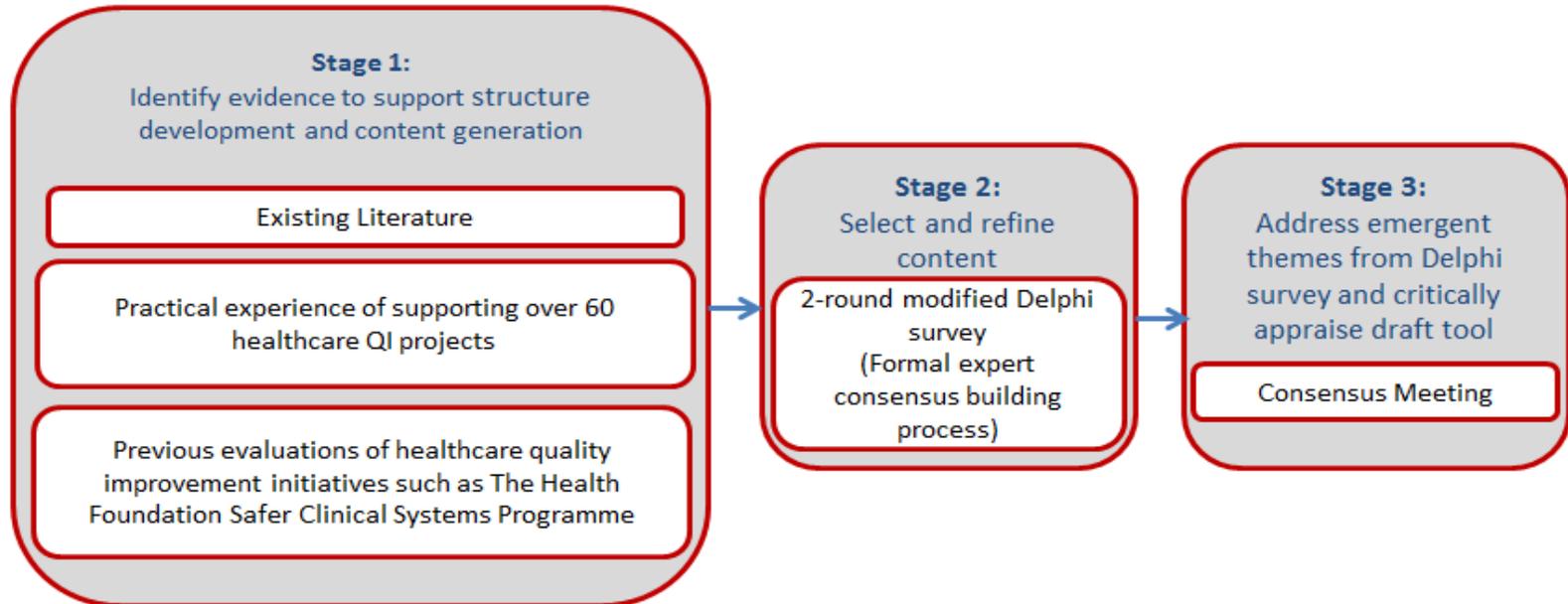# … and the reporting problem

Towards Improved Reporting

Beginning a process of developing "standards" for reporting statistical process control analyses

1. Article in submission highlighting issue

2. Seek funding and interest

3. Formal consensus process
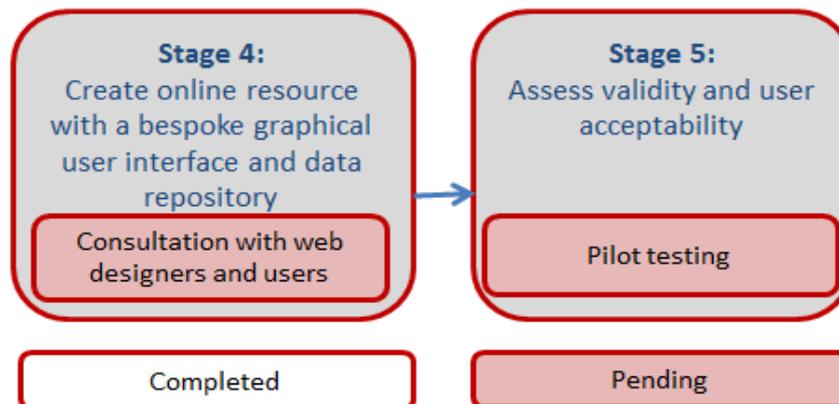
4. Standards

5. Evaluation of progress made

Improving Planning for Measurement in QI Initiatives

Methods

Results

Design

E.g. Have operational definitions been written for all the selected improvement measures?

Data Collection and Management

-...ction Process
-... and Embedding of
-... Data Collection
-Database Design
-Outliers and Missing Data

Analysis

-Planning the Analysis

Action

-Planning for Action

Embedding

-Planning for Sustainability

Results

Section	Subsection	Total number of questions in subsection	Total number of questions reaching consensus
Design	Aim	10	8 (80%)
	Measure Set	13	8 (62%)
	Operational Definition	27	18 (67%)
Data Collection and Management	Data Collection Process	13	8 (62%)
	Training in and Embedding of Consistent Data Collection	5	2 (40%)
	Database Design	4	3 (75%)
	Outliers and Missing Data	3	2 (67%)
Analysis	Planning the Analysis	16	9 (56%)
Action	Planning for Action	4	4 (100%)
Embedding	Planning the Sustainability	9	8 (89%)
	Total	**104**	**70 (67%)**

Table 1: Total number of questions per subsection, and % that reached the 75% consensus level at the end of the Delphi Survey

Methodology for Studying Improvement

"Designs that are better suited to the evaluation of clearly defined and static interventions may be adopted without giving sufficient attention to the challenges associated with the dynamic nature of improvement interventions and their interactions with contextual factors."
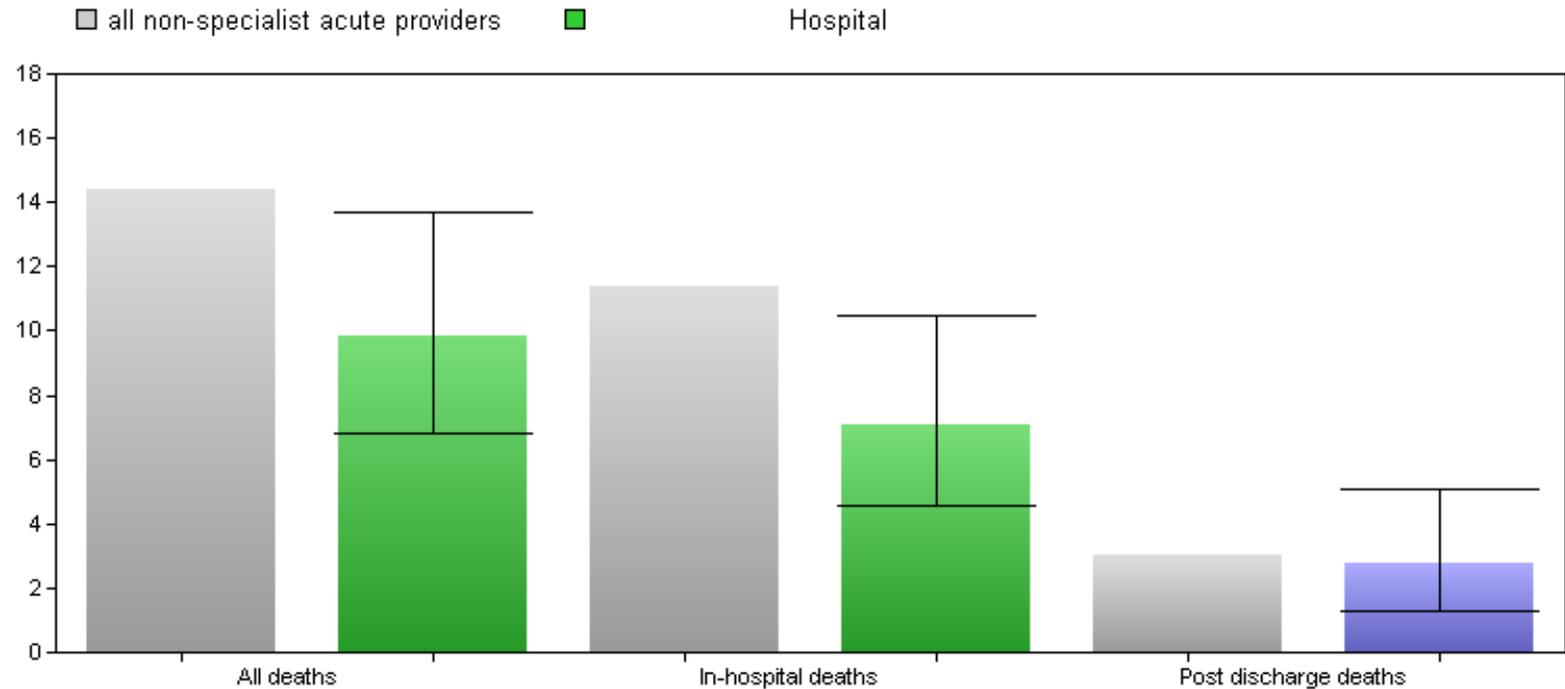
The Methodology Problem
COPD Bundle: process and outcome
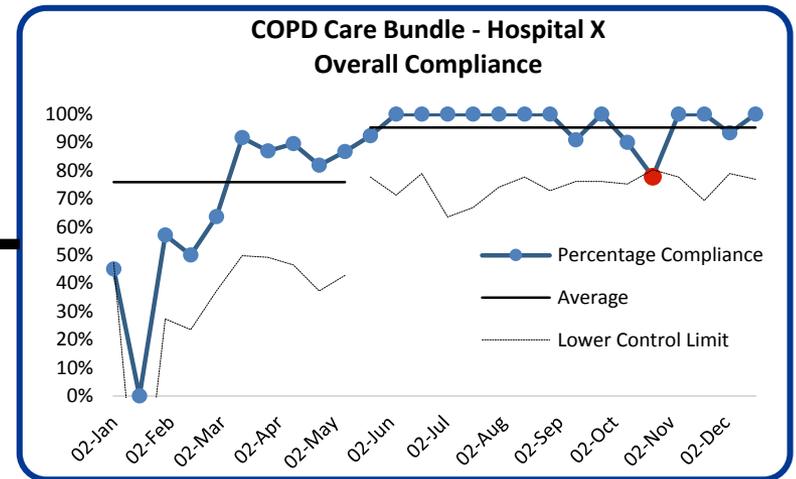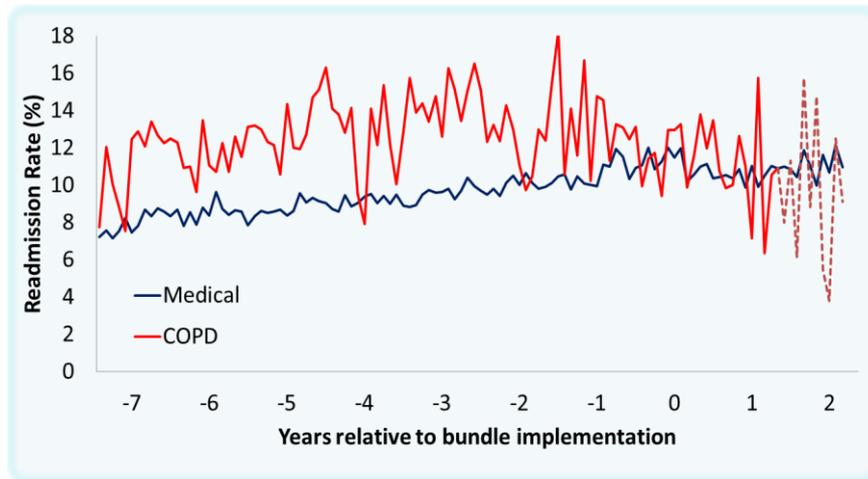
Heart Failure "Dr Foster" Data
Crude Mortality Rate 2015-2016 Hospital X

Hospital Standardised Mortality Ratio

- Observed deaths as ratio of "expected" deaths

- Way it is used indicative of underlying approach: improvement / judgement?

> "In April 2007, Dr Foster's Hospital Guide showed that the trust had an HSMR of 127 for 2005/06, in other words more deaths than expected. The trust established a group to look into mortality, but put much of its effort into attempting to establish whether the high rate was a consequence of poor recording of clinical information."

Bottle et al., Strengths and weaknesses of hospital standardised mortality ratios
BMJ 2011; 342 doi: https://doi.org/10.1136/bmj.c7116
Investigation into Mid Staffordshire NHS Foundation Trust, March 2009
http://webarchive.nationalarchives.gov.uk/20110504135228/http://www.cqc.org.uk/_db/_documents/Investigation_into_Mid_Staffordshire_NHS_Foundation_Trust.pdf

Hospital Standardised Mortality Ratio

- Use raw counts and rates in addition

- Use as part of a set of quality measures

- Understand variation using SPC

- Investigate signals in the data with an open mind

Social Science & Medicine
Volume 142, October 2015, Pages 19–26

Beyond metrics? Utilizing 'soft intelligence' for healthcare quality and safety

Graham P. Martin[a], Lorna McKee[b], Mary Dixon-Woods[a]
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Summary

- Leaders have a responsibility to reduce avoidable errors and waste in measurement
  - Allow time and resource for planning
  - Choosing the right tool for the job: statistical process control analysis for improvement
  - Apply this tool rigorously – and fully
  - Transparency in reporting
  - Lead by example!

Thank you!