Surgeon-Level Reporting Presented by Funnel Plot is Understood by Doctors but Inaccurately Interpreted by Members of the Public

Ashish Bhalla, MRCS, [*] *Prerna Mehrotra, MRCA,* [†] *Falah Amawi, MBBS,* [‡] *and Jonathan N. Lund, FRCS* [*]

[*]Department of Surgery, Royal Derby Hospitals NHS Trust, Derby, United Kingdom; [†]School of Anaesthesia, East Midlands North, Nottingham, United Kingdom; and [‡]Graduate Entry Medical School, University of Nottingham, Nottingham, United Kingdom

INTRODUCTION: Risk-adjusted outcome data for general surgeons practicing in the United Kingdom were published for the first time in 2013 with the aim of increasing transparency, improving standards, and providing the public with information to aid decision making. Most specialties used funnel plots to present their data. We assess the ability of members of the public (MoP), medical students, nonsurgical doctors (NSD), and surgeons to understand risk-adjusted surgical outcome data.

MATERIAL AND METHODS: A fictitious outcome dataset was created and presented in the form of a funnel plot to 10 participants from each of the aforementioned group. Standard explanatory text was provided. Each participant was given 5 minutes to review the funnel plot and complete a questionnaire. For each question, there was only 1 correct answer.

RESULTS: Completion rate was 100% ($n = 40$). No difference existed between NSD and surgeons. A significant difference for identification of the "worst performing surgeon" was noted between surgeons and MoP ($p < 0.01$) and between NSD and MoP ($p < 0.01$). Half of medical students and MoP claimed they would use this information to aid decision making compared with 80% of doctors. MoP reported the funnel plot significantly "more difficult" to interpret than surgeons did ($p < 0.01$) and NSD ($p < 0.01$).

CONCLUSIONS: MoP found these data significantly more "difficult to understand" and were less likely to both spot "outliers" and use this data to inform decisions than doctors. Surgeons should be aware that outcome data may require an alternative method of presentation to be understood by MoP. (J Surg 72:500-503. © 2015 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: funnel plot, risk-adjusted outcomes, surgical outcomes, mortality data

COMPETENCIES: Patient Care, Professionalism, Interpersonal and Communication Skills

INTRODUCTION

Risk-adjusted surgical outcome data were published for the first time in 2013 by the English National Health Service. The aim was to increase public transparency, improve practice, and provide better data for health service commissioners and more information to the public for informed decision making.[1]

In most cases, published data were presented in tables and depicted by funnel plots to aid interpretation. Surgical outcome data are complex and require presentation in a manner easily interpreted by both patients and clinicians but with enough information included to be of benefit. Funnel plots primarily provide a visual aid for highlighting bias and systematic heterogeneity. When used to depict surgical outcome data, poorly performing surgeons should be easily singled out from their peers. We aim to assess the ability of members of the public, medical students, nonsurgical doctors, and surgeons to understand risk-adjusted surgical outcome data depicted by a funnel plot.

MATERIALS AND METHODS

Participants included members of the public, medical students, nonsurgical doctors, and surgeons. For the

Correspondence: Inquiries to Ashish Bhalla, MBBS, MSc, Royal Derby Hospital, Uttoxeter Road, Derby DE22 3NE, UK; e-mail: ashbhalla@doctors.org.uk

1931-7204/$30.00
http://dx.doi.org/10.1016/j.jsurg.2014.12.003

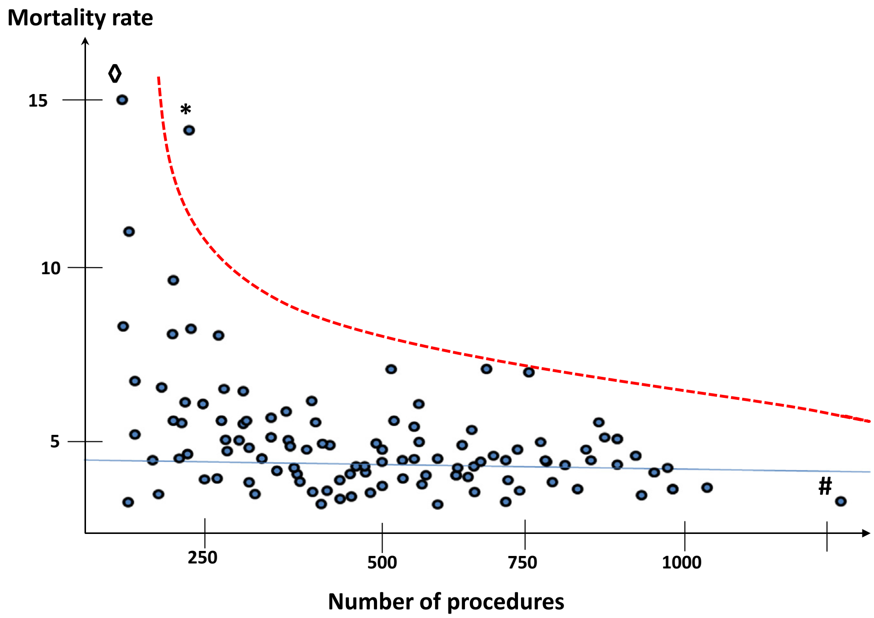

FIGURE 1. Funnel plot showing risk-adjusted outcomes data for surgeons. Average mortality is represented by the continuous blue line, whereas the dotted red line represents our control limit. Correct answers are depicted by the following symbols: (#) lowest mortality; (◊) highest mortality; (*) worst performer.

purpose of this study, medical students were in their first clinical year of study, nonsurgical doctors were defined as doctors within their first year of registration, and surgeons defined as doctors having completed membership examinations for the Royal College of Surgeons of England. The subgroup "members of the pubic" consisted of relatives of patients being seen in outpatient clinics.

A fictitious outcomes dataset was created and presented in the form of a funnel plot to 10 participants from each of the aforementioned group (Fig. 1). Standard explanatory text was provided (Fig. 2). The style of the plot mimicked published outcome data, and the explanatory text was made as simple as possible by removing unnecessary vocabulary and intentionally highlighting key aspects of the plot only.

Each participant was given 5 minutes to review the funnel plot and complete a questionnaire (Fig. 2). Participants were asked to highlight the "worst performing surgeon" (only outlier within the funnel plot) and the surgeons with the highest and lowest mortality. There was only 1 possible correct answer for each question. Each participant was asked whether they would use data presented in this form in the future and their degree of difficulty encountered in interpreting the results. Statistical analysis was conducted using SPSS Statistics 20 (IBM), with chi-squares tests used for nominal data and a Mann-Whitney *U* test for categorical data.

RESULTS

Every participant that we approached completed the questionnaire ($n = 40$). Participant responses to the questionnaire are shown in the Table. No statistical differences existed between nonsurgical doctors and surgeons. There was a significant difference in correct identification of the "worst performing surgeon" between surgeons and members of the public (*Fisher exact test*: $p < 0.01$) and between nonsurgical doctors and members of the public (*Fisher exact test*: $p < 0.01$). Only 50% of members of the public and medical students claimed that they would use the information presented in this form to aid decision making compared with 80% of doctors. Members of the public reported the funnel plot was significantly "more difficult" to interpret than surgeons and nonsurgical doctors did (*Mann-Whitney U*: $p < 0.01$).

CONCLUSIONS

Members of the public found our data significantly more "difficult to understand" than doctors did. They were less likely to spot "outliers" and most importantly were less likely use the data for future decision making than doctors were.

Funnel plots were first introduced by Light and Pillemer in 1984 as a method of highlighting the existence of publication bias within systematic reviews and meta-analyses.[2] Each individual plot represents the "effect estimate" from an individual study against a measure of each study's size. Fundamental to a funnel plot is the assumption that large studies will congregate around an average, whereas smaller studies will spread either side of this central average. Variation from this assumption indicates bias. A symmetric inverted funnel shape is associated with a dataset in which