

The effects of power, leadership and psychological safety on resident event reporting

Nital P Appelbaum,¹ Alan Dow,¹ Paul E Mazmanian,¹ Dustin K Jundt² & Eric N Appelbaum³

CONTEXT Although the reporting of adverse events is a necessary first step in identifying and addressing lapses in patient safety, such events are under-reported, especially by front-line providers such as resident physicians.

OBJECTIVES This study describes and tests relationships between power distance and leader inclusiveness on psychological safety and the willingness of residents to report adverse events.

METHODS A total of 106 resident physicians from the departments of neurosurgery, orthopaedic surgery, emergency medicine, otolaryngology, neurology, obstetrics and gynaecology, paediatrics and general surgery in a mid-Atlantic teaching hospital were asked to complete a survey on psychological safety, perceived power distance, leader inclusiveness and intention to report adverse events.

RESULTS Perceived power distance ($\beta = -0.26$, standard error [SE] 0.06, 95% confidence interval [CI] -0.37 to 0.15 ; $p < 0.001$) and leader inclusiveness ($\beta = 0.51$; SE 0.07, 95% CI 0.38 – 0.65 ; $p < 0.001$) both significantly predicted psychological safety,

which, in turn, significantly predicted intention to report adverse events ($\beta = 0.34$; SE 0.08, 95% CI 0.18 – 0.49 ; $p < 0.001$). Psychological safety significantly mediated the direct relationship between power distance and intention to report adverse events (indirect effect: -0.09 ; SE 0.02, 95% CI -0.13 to 0.04 ; $p < 0.001$). Psychological safety also significantly mediated the direct relationship between leader inclusiveness and intention to report adverse events (indirect effect: 0.17 ; SE 0.02, 95% CI 0.08 – 0.27 ; $p = 0.001$).

CONCLUSIONS Psychological safety was found to be a predictor of intention to report adverse events. Perceived power distance and leader inclusiveness both influenced the reporting of adverse events through the concept of psychological safety. Because adverse event reporting is shaped by relationships and culture external to the individual, it should be viewed as an organisational as much as a personal function. Supervisors and other leaders in health care should ensure that policies, procedures and leadership practices build psychological safety and minimise power distance between low- and high-status members in order to support greater reporting of adverse events.

Medical Education 2016; 50: 343–350
doi: 10.1111/medu.12947

Discuss ideas arising from the article at
www.mededuc.com/discuss.



¹Virginia Commonwealth University School of Medicine, Richmond, Virginia, USA

²Saint Louis University, St Louis, Missouri, USA

³Virginia Commonwealth University Health, Richmond, Virginia, USA

Correspondence: Nital P Appelbaum, Office of Assessment and Evaluation Studies, Virginia Commonwealth University School of Medicine, 730 East Broad Street, PO Box 980466, Richmond, Virginia 23298, USA. Tel: 00 1 804 827 1856; E-mail: nital.appelbaum@vcuhealth.org

INTRODUCTION

The maintenance of patient safety is a global challenge affecting health care delivery across cultures and societies.¹ Effective systems of event reporting are critical to improved patient safety and enable those responsible for evaluating adverse events to understand their impacts and causes.² Unfortunately, despite an emphasis on the reporting of adverse events, such occurrences remain under-reported.

Many adverse event reporting efforts fail to acknowledge the complexity of the organisations in which care is delivered and the psychological factors that influence event reporting.³ Barriers to event reporting include fear of retribution, worry about litigation, lack of knowledge on what constitutes a reportable event, time constraints, unsupportive colleagues, and the notion that no systematic change will result from reporting an adverse event.⁴ Researchers have described the failure of hospitals to take other factors (e.g. motivational drivers, barriers against reporting, training on reporting, reporting culture) into account when implementing technological solutions.⁵ Outside health care, Probst and Estrada³ found, on average, 2.48 unreported events for every reported event in a sample of 425 employees across five industries, including manufacturing, heating and cooling, dental manufacture, paper milling and hospitality. Those organisations with poor safety cultures and little emphasis from supervisors on safety had the lowest numbers of adverse event reports, exemplifying the importance of culture and leadership.³ Adverse event reporting can be seen as an output from a complex system of personal, interpersonal and environmental relationships.

The Institute of Medicine highlighted a systematic problem underlying the reporting of adverse events within health care: ‘...counterproductive hierarchical communication patterns that derive from status differences are partly responsible for many medical errors.’⁶ Although the hierarchical relationship between physicians and nurses is commonly cited in the literature,⁷ a similar relationship of status differences may exist between residents and attending physicians. Although they have earned a medical degree, residents appear to be subject to a difference in status because they are trained under the leadership of attending physicians whose supervisory roles are not only integral to the tradition of apprenticeship in medicine, but are also regulated by the business of medical education.^{8–10} However, poor working relationships between faculty staff and

residents may suppress behaviours necessary for patient safety.^{11,12}

In academic health centres, residents are usually the doctors most directly engaged in patient care and, therefore, on the frontlines of adverse event reporting. A study of 144 residents and 42 senior doctors showed that residents were significantly more likely than senior doctors to report events (85.4% and 58.4%, respectively; relative risk 0.58, 95% confidence interval [CI] 0.46–0.73),¹³ but residents still significantly under-report adverse events through the formal system.¹⁴ Although there is a formal, hierarchical link between attending physicians and residents, the actual variation in attending physician–resident relationships and its impact on event reporting is still unclear.⁵ Vincent *et al.*⁴ found that one reason why junior staff do not report adverse events is that they fear they will be blamed for the event. Similarly, in medical students, increasing hierarchical distance has been shown to affect intention to report adverse events.¹⁵

Psychological safety

When discussing the relationship between high- and low-status members, psychological safety is defined as the belief that a person can express himself or herself without negative consequences.^{16,17} Low-status members can feel anxiety and fear in situations in which they are required to take interpersonal risks such as by asking for help or feedback, experimenting, reporting events or proposing novel ideas.^{18–20} Fear of being labelled ignorant, incompetent or disruptive in the workplace by colleagues can lead to low psychological safety.¹⁹ The consequences of taking a risk can also diminish one’s self-image, status, or even career within an organisation.^{19–21} Accordingly, a leader has the power to influence a follower’s psychological safety, both positively and negatively.⁷ A leader can exhibit behaviours that shape climate and culture, which influence a follower’s sense of security and affective state.²²

Low psychological safety in low-status members is thought to be a key contributor to medical adverse events.⁷ Negative tension between high- and low-status members can easily bleed over from interpersonal strains to poor health care outcomes for patients.^{6,7} In addition, low-status members (e.g. nurses, residents, technicians, medical students) may avoid engagement in quality improvement initiatives, including event reporting, out of fear of negative consequences such as public criticism and loss of rewards or opportunities.^{7,13} Previous studies

have identified psychological safety as a key antecedent to intention to report events,^{20,23,24} as well as actual reporting behaviour.²⁵

Leader inclusiveness

Adequate leader support may minimise perceived negative consequences attributed to event reporting, especially for low-status members. Leader inclusiveness, the explicit display of openness, availability and accessibility by leaders, focuses on followers' perceptions that leadership acknowledges their contributions.^{7,26} Low-status members are provided with the opportunity to contribute new ideas and opinions that may be perceived as risk-taking and as defying set norms.²⁶ Importantly, how followers perceive leader behaviours or values may be more telling of subsequent follower actions than actual leader behaviours or leaders' perceptions of their own behaviours.⁷ In health care, the expectation of leader inclusiveness is often espoused but not always experienced by low-status members, particularly in the context of the traditional power structure within medical institutions.²⁷

Nembhard and Edmondson⁷ found perceived leader inclusiveness positively predicted engagement in quality improvement work; this relationship was fully mediated by psychological safety. Two additional studies^{26,28} tested the relationship between leader inclusiveness and psychological safety at the individual level, as opposed to the group level of analysis used by Nembhard and Edmondson,⁷ and also found leader inclusiveness positively predicted follower psychological safety.

In a review of the literature, we were unable to identify any study examining the effects of leader inclusiveness on psychological safety as the latter pertains to intention to report adverse events.

Power distance

Power distance is the extent to which an individual perceives unequal distributions in status and power within institutions and organisations.^{29,30} If an individual of low status perceives a high level of power-related distance, he or she is less likely to question someone of high status.³¹ In health care, the culture is deeply rooted in hierarchy.^{32,33} Kaiser Permanente, one of the largest US not-for-profit health plans serving 10.1 million members, highlighted power distance as a substantial barrier against people speaking up about patient safety concerns in their system.³³ Another study found that followers in the USA expressed their opinions, a behaviour

reflecting high psychological safety, most frequently when power distance was low and the relationship between leader and follower was perceived positively.³⁴ A study of Taiwanese nurses found that 45% of the variance in barriers to reporting medication administration errors was attributed to perceived power distance in decision making.³⁵ Power distance has the ability to diminish psychological safety across different countries and health systems. We were unable to find any empirical reports assessing the indirect relationship between power distance and intention to report adverse events as mediated through psychological safety.

Study aims

Based on these observations in the literature, we hypothesised that psychological safety mediates the positive relationship between leader inclusiveness and intention to report events, as well as the negative relationship between power distance and intention to report events. The current study aimed to: (i) describe the relationship between psychological safety and intention to report adverse events; (ii) test for the presence and strength of the hypothesised negative correlation between perceived power distance and psychological safety as a mediator of the intention to report adverse events, and (iii) test for the presence and strength of the hypothesised positive correlation between leader inclusiveness and psychological safety as a mediator of the intention to report adverse events.

METHODS

Setting and procedure

This study was approved by our institution's internal review board. Participants were recruited through convenience sampling from a mid-Atlantic teaching hospital serving a large urban population. Data were collected between June 2014 and January 2015 among residents with at least 1 month's experience as physicians. Programme directors were e-mailed to gauge interest in study participation. Programmes expressing interest were asked to indicate meeting times in which the lead investigator could be allotted 10 min of agenda time to recruit residents and interns for study participation. The consent and data collection sessions occurred at the start of journal club or grand rounds, in contexts in which attendees were spread out across the room. Some attending physicians were present while residents completed the survey as we were taking time from an existing

meeting to recruit participants. Paper surveys were anonymous and were submitted directly to the lead investigator at the end of the consenting session. Participants were able to skip questions they deemed to be sensitive and could turn in blank surveys to avoid their identification as a study participant.

Measures

Power distance was measured using the seven hierarchy-specific items from the Cultural Perspective Questionnaire Version 4 (CPQ4) survey ($\alpha = 0.79$).³⁶ A validation survey across five countries showed the orientation domain that included the hierarchy items had an acceptable goodness-of-fit index of 0.92.³⁷ The hierarchy items resulted in consistent differences in power distance between countries, as found in previous research.³⁷ All items were interpreted at the individual level of analysis and were tailored to reflect perceived power distance within the respondents' current health systems.

Leader inclusiveness was assessed using Carmeli *et al.*'s²⁶ nine-item measure because it is the most developed scale on the construct and showed high internal reliability ($\alpha = 0.89$). Similar to our factor analysis results, their construct validity results²⁶ showed acceptable fit, with an eigenvalue of 6.18, 68% of variance explained by the single-factor model, and factor loadings ranging from 0.51 to 0.82.

Psychological safety in the context of each participant's department was measured using Edmondson's scale,²⁰ a seven-item survey on which agreement is indicated using a five-point Likert scale, which demonstrated reliability ($\alpha = 0.79$). Various studies have shown sufficient construct validity evidence for the scale across different levels of analysis and populations.^{20,21,38}

Guided by Ajzen,³⁹ we developed a scale to measure intention to report adverse events. Internal consistency among the six items on likelihood of intention was high ($\alpha = 0.72$). We used intention to report instead of actual reporting behaviour as actual reporting is contingent on an event occurring and because other factors may inhibit the behaviour of reporting (e.g. technology).⁴⁰ Intention has been shown to predict behaviour across a wide range of studies.⁴¹ Respondents indicated the likelihood of their reporting events that varied in severity on a five-point Likert scale (1 = highly unlikely, 5 = highly likely). The adverse events were developed to be relevant across different departments within the hospital and were reviewed by subject

matter experts in medicine and performance improvement within the health system.

Analyses

A factor analysis was conducted on each of our measures using IBM SPSS Statistics for Windows Version 22.0 (IBM Corp., Armonk, NY, USA) prior to testing our path model. Subsequently, a path analysis conducted in MPLUS Version 6.12⁴² was used to describe the relationships between study variables. Although path analysis can be conducted through multiple regression, we used a structural equation modelling (SEM) framework.⁴³ Structural equation modelling provides both individual path coefficients (like multiple regression), whereby a single-ended arrow represents a regression path between two variables, as well as the added benefit of overall model fit statistics which allow for the simultaneous examination of our entire specified model. It does not provide direct evidence of causality, but it can test associations specified by a theoretical foundation. Overall model fit was evaluated using a root mean square error of approximation (RMSEA) value of < 0.05 , a comparative fit index (CFI) of > 0.90 , a non-significant chi-squared value, and a standardised root mean square residual (SRMR) value of < 0.10 .⁴³ Leader inclusiveness and perceived power distance were identified as independent variables; psychological safety was the mediator variable, and intention to report was the dependent variable. Departmental affiliation was used as a cluster variable.

RESULTS

Factor analysis

A factor analysis on each of our measures showed adequate validity (Table 1). Although some items had low loadings, all items were retained in the path analysis to maintain scale integrity. A principal components analysis with varimax rotation showed adequate validity for our newly developed intention to report adverse events measure.

Demographics

A total of 106 residents from eight different residency programmes completed our survey. Participating departments included neurology ($n = 6$), paediatrics ($n = 29$), emergency medicine ($n = 15$), obstetrics and gynaecology ($n = 12$), general surgery ($n = 14$), otolaryngology ($n = 7$), neurosurgery ($n = 6$), and orthopaedic surgery ($n = 17$). Men and women were

equally represented ($n = 53$, 50% each). The majority of respondents identified as White ($n = 76$, 72%), and the remaining respondents identified as Asian ($n = 20$, 19%), African American ($n = 4$, 4%), and Other ($n = 5$, 5%). One respondent did not identify their ethnicity. The average length of experience working at the mid-Atlantic teaching hospital was 4 years across departments.

Descriptive analyses

Perceived power distance was negatively correlated with psychological safety ($r = -0.36$, $p < 0.01$) and reporting intentions ($r = -0.21$, $p < 0.05$) (Table 2). Conversely, leader inclusiveness was positively correlated with psychological safety ($r = 0.52$, $p < 0.01$) and reporting intentions ($r = 0.21$, $p < 0.05$). Psychological safety was also positively correlated with reporting intentions

($r = 0.31$, $p < 0.01$). Department, gender, years of experience and race were not correlated with any of the study variables. Means and standard deviations for study variables are listed in Table 2.

Path analysis

Our model indicated good fit (RMSEA 0.032, CFI 0.999, $\chi^2 = 2.22$, $p =$ not significant, SRMR 0.029). Perceived power distance ($\beta = -0.26$; SE 0.06, 95% CI -0.37 to 0.15 ; $p < 0.001$) and leader inclusiveness ($\beta = 0.51$; SE 0.07, 95% CI 0.38 – 0.65 ; $p < 0.001$) both significantly predicted psychological safety, which, in turn, significantly predicted intention to report adverse events ($\beta = 0.34$; SE 0.08, 95% CI 0.18 – 0.49 ; $p < 0.001$) (Fig. 1). Both the indirect effect of perceived power distance on intention to report mediated through psychological safety (indirect effect: -0.09 ; SE 0.02, 95% CI -0.13

Table 1 Sample survey items and factor analysis results for construct validity

| Construct | Sample survey item | Model | Range of loadings | Eigenvalue | Variance explained, % |
|-----------------------------------|---|---------------------|------------------------|--------------|-----------------------|
| Perceived power distance | X medical centre has a hierarchy of authority | One-factor model | 0.53–0.71 | 3.17 | 36 |
| Leader inclusiveness | Attendings in my department are open to hearing new ideas | One-factor model | 0.79–0.87 | 6.12 | 68 |
| Psychological safety | It is safe for me to take a risk in this department | One-factor model | 0.33–0.76 | 3.23 | 38 |
| Intention to report adverse event | I would report a breach in confidentiality | Two-component model | 0.64–0.80 0.52–0.89 | 2.54 1.09 | 42 18 |

Table 2 Summary of intercorrelations, means and standard deviations (SDs)

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Mean | SD |
|-------------------------------------|--------|-------|-------|-------|-------|--------------------|-------------------|------|------|
| 1 Department | –0.20* | –0.17 | –0.01 | –0.01 | –0.07 | –0.15 | –0.06 | – | – |
| 2 Gender | | 0.05 | –0.05 | 0.07 | 0.05 | –0.10 | –0.01 | – | – |
| 3 Years of experience | | | 0.00 | 0.06 | 0.03 | –0.03 | 0.12 | 4.00 | 2.52 |
| 4 Race | | | | 0.09 | –0.04 | 0.04 | 0.03 | – | – |
| 5 Power distance | | | | | –0.14 | –0.36 [†] | –0.21* | 3.10 | 0.62 |
| 6 Leader inclusiveness | | | | | | 0.52 [†] | 0.21* | 4.01 | 0.51 |
| 7 Psychological safety | | | | | | | 0.31 [†] | 3.52 | 0.54 |
| 8 Intention to report adverse event | | | | | | | | 3.68 | 0.60 |

* $p < 0.05$

[†] $p < 0.01$



Figure 1 Perceived power distance and leader inclusiveness significantly predict intention to report adverse events through psychological safety. * $p < 0.05$, † $p < 0.01$

to -0.04 ; $p < 0.001$) and the indirect effect of perceived leader inclusiveness on intention to report mediated through psychological safety (indirect effect: 0.17 ; SE 0.02 , 95% CI 0.08 – 0.27 ; $p = 0.001$) were statistically significant. As low-status members increased one unit in perceived power distance, psychological safety decreased by 0.26 unit, and as low-status members increased one unit in perceived leader inclusiveness, psychological safety increased by 0.51 unit. Subsequently, as psychological safety increased one unit, intention to report adverse events increased by 0.34 unit.

DISCUSSION

Our proposed model was supported, suggesting that as residents perceived reduced power distance and increased leader inclusiveness, their sense of psychological safety and intention to report adverse events increased. Our results have several implications for leaders in education, residents and researchers.

Because health care leaders and policymakers seek to increase adverse event reporting, faculty staff should strive to create a culture in which the power distance between high- and low-status members is minimised and leader inclusiveness is increased.⁴⁴ Pfeiffer *et al.*'s²⁴ literature review on motivations for event reporting highlighted psychological safety as a barrier: 'Faculty do not encourage residents to report [adverse] medical events.' Initiatives to increase event reporting amongst resident physicians must support high psychological safety by communicating clearly the process of reporting and its terms of confidentiality, and providing safeguards to avoid any punitive backlash.^{4,14} In addition, attending physicians should exhibit behaviours that are inclusive of residents, such as by sharing critical information, initiating meetings to discuss the progress of both patients and learners, being available for consultation, and representing an ongoing presence within the team.^{20,21} Leaders, such as pro-

gramme directors, should strive to help clinical faculty staff develop as open, available and accessible to low-status team members.

For graduate medical education (GME) in particular, the current study provides empirical evidence that residents' perceptions of attending physicians impact on psychological safety and can inhibit the intention to report adverse events. In the context of recent US efforts to improve the engagement of residents in the provision of safe, high-quality patient care,⁴⁵ our study constructs may provide an approach with which to assess the learning culture and measure the impact of interventions. Organisations, in turn, must take on the role of facilitating positive relationships between high- and low-status team members through procedures and policies that flatten hierarchy and develop leaders who exhibit inclusive behaviours. A recent conceptual framework for integrating quality and safety into teaching hospitals identified organisational culture as one of six key elements requiring focus for a paradigm shift in GME.⁴⁵ Leaders should encourage and engage residents in event reporting, support a systematic review of events without blame, and leverage GME conferences (e.g. morbidity and mortality conferences) as fora in which to discuss adverse events.⁴⁵ In practice, Kaiser Permanente implemented structured communication across team roles to facilitate a safe way of allowing individuals to speak up regarding patient safety concerns.³³ As part of this programme, clinical leaders provided opportunities within daily work to surface patient safety issues through preoperative debriefings. As such, event reporting should be seen as signalling organisational and cultural competency, as much as the individual competency of a learner or practitioner.

Investigators can extend this study in several ways. Tools for measuring the concepts in this study can be further refined and additional antecedents to reporting intention may be identified. More importantly, by tracking changes in perceptions of power distance, perceived leader inclusiveness and psycho-

logical safety over time, we can better define ways to increase patient safety.

Limitations

Key limitations to the present study include its use of intention to report an adverse event as the primary outcome. Actual event reporting behaviour can only be inferred.⁴⁰ Likewise, there is no commonly used measure of reporting intention in the literature and therefore a measurement tool was developed for this study. The scale reliability statistic and factor analysis was adequate, but the actual items were specific to reporting concrete events and the tool requires further psychometric validation. The study data were also limited to one health care system and were cross-sectional, which limits their generalisability. A procedural limitation refers to the fact that some residents were surveyed in the presence of attending physicians.

CONCLUSIONS

In this study, we demonstrated that intention to report adverse events is affected by psychological safety, which is positively associated with leader inclusiveness and negatively associated with power distance. These findings identify important antecedents to desired behaviours among resident physicians and have broader implications for the organisation of health care, training of residents, and evaluation of the health care environment. Adverse event reporting should be seen as a complex cultural phenomenon in health care. Educators and leaders should integrate these concepts into new initiatives as they seek to increase patient safety and the overall quality of care.

Contributors: NPA contributed to the conceptualisation and design of the study, and to the acquisition and analysis of data. All authors contributed to the interpretation of data, and to the drafting and critical revision of the article. All authors approved the final manuscript for publication.

Acknowledgements: the authors would like to thank the resident physicians for giving up their time to participate in this study.

Funding: this study was internally funded. PEM is supported by the National Institutes of Health's National Center for Advancing Translational Science (award no. UL1TR000058).

Conflicts of interest: none.

Ethical approval: this study was approved by the Virginia Commonwealth University Health Internal Review Board (HM20001880).

REFERENCES

- 1 World Health Organization. *World Health Report 2008: Primary Health Care: Now more than Ever*. Geneva: WHO 2008.
- 2 World Health Organization. *World Health Report 2005: Make Every Mother and Child Count*. Geneva: WHO 2005.
- 3 Probst TM, Estrada AX. Accident under-reporting among employees: testing the moderating influence of psychological safety climate and supervisor enforcement of safety practices. *Accid Anal Prev* 2010;**42** (5):1438–44.
- 4 Vincent C, Stanhope N, Crowley-Murphy M. Reasons for not reporting adverse incidents: an empirical study. *J Eval Clin Pract* 1999;**5** (1):13–21.
- 5 Boike JR, Bortman JS, Radosta JM, Turner CL, Anderson-Shaw L, Centomani NM, Chamberlin WH, Mayer D, McDonald T, Goldstein JL. Patient safety event reporting expectation: does it influence residents' attitudes and reporting behaviours? *J Patient Saf* 2013;**9** (2):59–67.
- 6 Page A. *Keeping Patients Safe: Transforming the Work Environment of Nurses*. Washington, DC: National Academies Press 2004.
- 7 Nembhard IM, Edmondson AC. Making it safe: the effects of leader inclusiveness and professional status on psychological safety and improvement efforts in health care teams. *J Organ Behav* 2006;**27** (7):941–66.
- 8 Sklar DP. Faculty supervision of residents – creating important moments of magic. *Acad Med* 2013;**88** (4):431–3.
- 9 Kilminster SM, Jolly BC. Effective supervision in clinical practice settings: a literature review. *Med Educ* 2000;**34** (10):827–40.
- 10 Kilminster S, Cottrell D, Grant J, Jolly B. AMEE Guide No. 27: effective educational and clinical supervision. *Med Teach* 2007;**29** (1):2–19.
- 11 Ross PT, McMyler ET, Anderson SG, Saran KA, Urteaga-Fuentes A, Boothman RC. Trainees' perceptions of patient safety practices: recounting failures of supervision. *Jt Comm J Qual Patient Saf* 2011;**37** (2):88–95.
- 12 Ludmerer KM. *Let Me Heal: The Opportunity to Preserve Excellence in American Medicine*. New York, NY: Oxford University Press 2015.
- 13 Evans SM, Berry JG, Smith BJ, Esterman A, Selim P, O'Shaughnessy J, DeWitt M. Attitudes and barriers to incident reporting: a collaborative hospital study. *Qual Saf Health Care* 2006;**15** (1):39–43.
- 14 Kaldjian LC, Jones EW, Wu BJ, Forman-Hoffman VL, Levi BH, Rosenthal GE. Reporting medical errors to improve patient safety: a survey of physicians in teaching hospitals. *Arch Intern Med* 2008;**168** (1):40–6.
- 15 Wetzel AP, Dow AW, Mazmanian PE. Patient safety attitudes and behaviours of graduating medical students. *Eval Health Prof* 2012;**35** (2):221–38.
- 16 Carmeli A, Gittell JH. High-quality relationships, psychological safety, and learning from failures in work organisations. *J Organ Behav* 2009;**30** (6):709–29.

- 17 Kahn WA. Psychological conditions of personal engagement and disengagement at work. *Acad Manage J* 1990;**33** (4):692–724.
- 18 Edmondson A. The local and variegated nature of learning in organisations: a group-level perspective. *Organ Sci* 2002;**13** (2):128–46.
- 19 Edmondson A. Managing the risk of learning: psychological safety in work teams. In: West MA, Tjosvold D, Smith KG, eds. *International Handbook of Organizational Teamwork and Cooperative Working*. Chichester: John Wiley & Sons 2003;255–75.
- 20 Edmondson A. Psychological safety and learning behaviour in work teams. *Adm Sci Q* 1999;**44** (2):350–83.
- 21 Carmeli A, Brueller D, Dutton JE. Learning behaviours in the workplace: the role of high-quality interpersonal relationships and psychological safety. *Syst Res Behav Sci* 2009;**26** (1):81–98.
- 22 Ostroff C, Kinicki A, Tamkins M. Organisational culture and climate. In: Borman WC, Ilgen DR, Klimoski RJ, eds. *Comprehensive Handbook of Psychology*, Vol 12. *I/O Psychology*. New York, NY: John Wiley & Sons 2003;565–593.
- 23 Coyle YM, Mercer SQ, Murphy-Cullen CL, Schneider GW, Hynan LS. Effectiveness of a graduate medical education programme for improving medical event reporting attitude and behaviour. *Qual Saf Health Care* 2005;**14** (5):383–8.
- 24 Pfeiffer Y, Manser T, Wehner T. Conceptualising barriers to incident reporting: a psychological framework. *Qual Saf Health Care* 2010;**19** (6):e60.
- 25 Edmondson AC, Bohmer RM, Pisano GP. Disrupted routines: team learning and new technology implementation in hospitals. *Adm Sci Q* 2001;**46** (4):685–716.
- 26 Carmeli A, Reiter-Palmon R, Ziv E. Inclusive leadership and employee involvement in creative tasks in the workplace: the mediating role of psychological safety. *Creativity Res J* 2010;**22** (3):250–60.
- 27 Bate P. Changing the culture of a hospital: from hierarchy to networked community. *Public Admin* 2000;**78** (3):485–512.
- 28 Hirak R, Peng AC, Carmeli A, Schaubroeck JM. Linking leader inclusiveness to work unit performance: the importance of psychological safety and learning from failures. *Leadersh Q* 2012;**23** (1):107–17.
- 29 Hofstede G. *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations across Nations*, 2nd edn. Thousand Oaks, CA: Sage Publications 2001.
- 30 Schaubroeck J, Lam SS, Cha SE. Embracing transformational leadership: team values and the impact of leader behaviour on team performance. *J Appl Psychol* 2007;**92** (4):1020–30.
- 31 Cole MS, Carter MZ, Zhang Z. Leader-team congruence in power distance values and team effectiveness: the mediating role of procedural justice climate. *J Appl Psychol* 2013;**98** (6):962–73.
- 32 Starr P. *The Social Transformation of American Medicine*. New York, NY: Basic Books 1982.
- 33 Leonard M, Graham S, Bonacum D. The human factor: the critical importance of effective teamwork and communication in providing safe care. *Qual Saf Health Care* 2004;**13** (Suppl 1):85–90.
- 34 Botero IC, Van Dyne L. Employee voice behaviour interactive effects of LMX and power distance in the United States and Colombia. *Manage Commun Q* 2009;**23** (1):84–104.
- 35 Chiang H, Pepper GA. Barriers to nurses' reporting of medication administration errors in Taiwan. *J Nurs Scholarsh* 2006;**38** (4):392–9.
- 36 Maznevski M, DiStefano J, Gomez C, Nooderhaven N, Wu P. The cultural orientations framework and international management research. Academy of International Business Annual Meeting, 8–12 October 1997, Monterrey.
- 37 Maznevski ML, Distefano JJ, Gomez CB, Nooderhaven NG, Wu PC. Cultural dimensions at the individual level of analysis: The cultural orientations framework. *International Journal of Cross-Cultural Management* 2002;**2** (3):275–295.
- 38 Kark R, Carmeli A. Alive and creating: the mediating role of vitality and aliveness in the relationship between psychological safety and creative work involvement. *J Organ Behav* 2009;**30** (6):785–804.
- 39 Ajzen I. Constructing a theory of planned behaviour questionnaire. 2006. <http://people.umass.edu/aizen/pdf/tpb.measurement.pdf>. [Accessed 8 September 2015.]
- 40 Ajzen I. The theory of planned behaviour. *Organ Behav Hum Decis Process* 1991;**50** (2):179–211.
- 41 Webb TL, Sheeran P. Does changing behavioural intentions engender behaviour change? A meta-analysis of the experimental evidence. *Psychol Bull* 2006;**132** (2):249–68.
- 42 Muthén LK, Muthén L. *Mplus*. Los Angeles, CA: Muthén & Muthén 1998.
- 43 Kline R. *Principles and Practice of Structural Equation Modeling*, 3rd edn. New York, NY: Guilford Press 2011.
- 44 Accreditation Council for Graduate Medical Education. Clinical Learning Environment Review (CLER) pathways to excellence: expectations for an optimal clinical learning environment to achieve safe and high quality patient care. 2014. https://www.acgme.org/acgmeweb/Portals/0/PDFs/CLER/CLER_Brochure.pdf. [Accessed 8 September 2015.]
- 45 Tess A, Vidyarthi A, Yang J, Myers JS. Bridging the gap: a framework and strategies for integrating the quality and safety mission of teaching hospitals and graduate medical education. *Acad Med* 2015;**90** (9):1251–7.

Received 19 June 2015; editorial comments to author 24 August 2015, 21 September 2015; accepted for publication 29 September 2015