



DEPARTMENT OF SURGERY

# Wisconsin Surgical Outcomes Research Program

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# No (Wo)man is an Island: Culture, Teams, and Communication

Caprice C. Greenberg, MD, MPH

Professor of Surgery, Population Health Sciences,  
and Systems/Industrial Engineering

The Morgridge Distinguished Chair in Health Services Research

Director, Wisconsin Surgical Outcomes Research (WiSOR) Program

Vice Chair of Research, Department of Surgery

University of Wisconsin - Madison

# Overview

- Do interpersonal skills and communication matter?
- How do we define a team?
- What is the role of leadership?
- How do we optimize the use of fluid teams?
- What can individual surgeons do to optimize interpersonal skills and team communication?



---

# INTER-PERSONAL SKILLS AND TEAM COMMUNICATION MATTER



DEPARTMENT OF SURGERY  
**WiSOR**  
UNIVERSITY OF WISCONSIN  
SCHOOL OF MEDICINE AND PUBLIC HEALTH

# TJC Sentinel Events

- Sentinel events are reported to The Joint Commission voluntarily or via a complaint
- Root cause analysis is performed
  - Identify fundamental reasons for the failure
  - Points in the process where an intervention could be implemented
  - Majority of events have multiple root causes



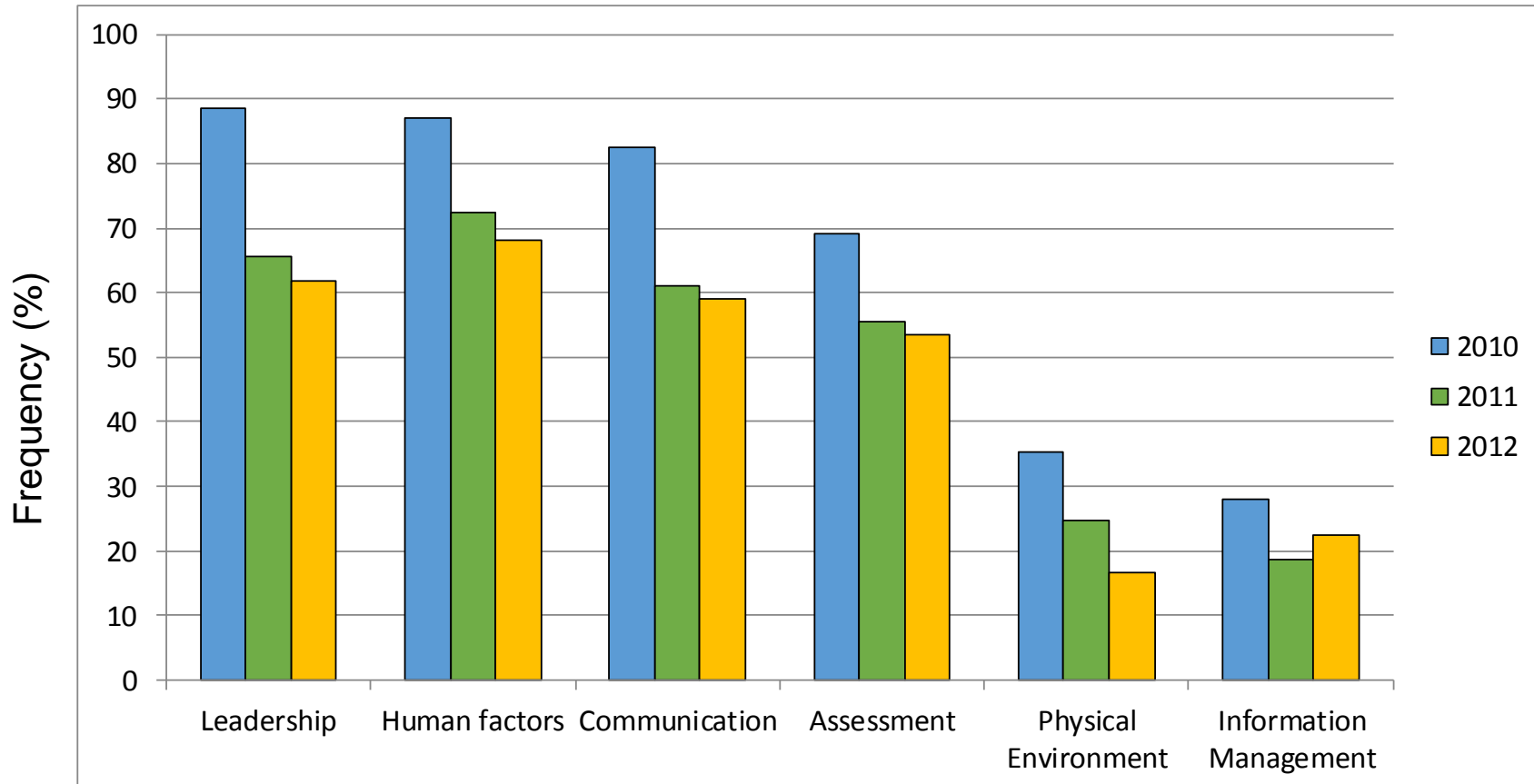
DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Most Frequently Identified Root Causes of Sentinel Events



DEPARTMENT OF SURGERY

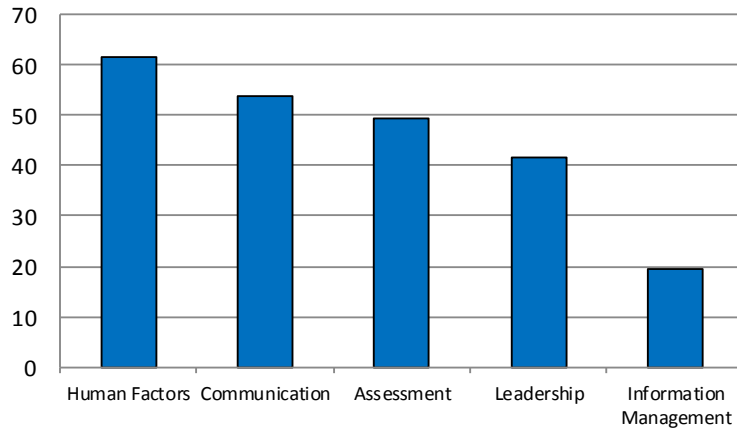
**WiSOR**

UNIVERSITY OF WISCONSIN

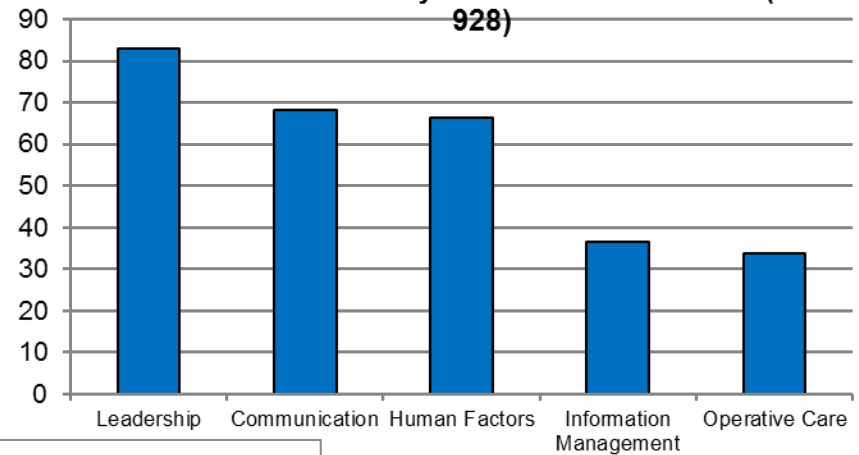
SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Surgical Root Causes (2004 – 2012)

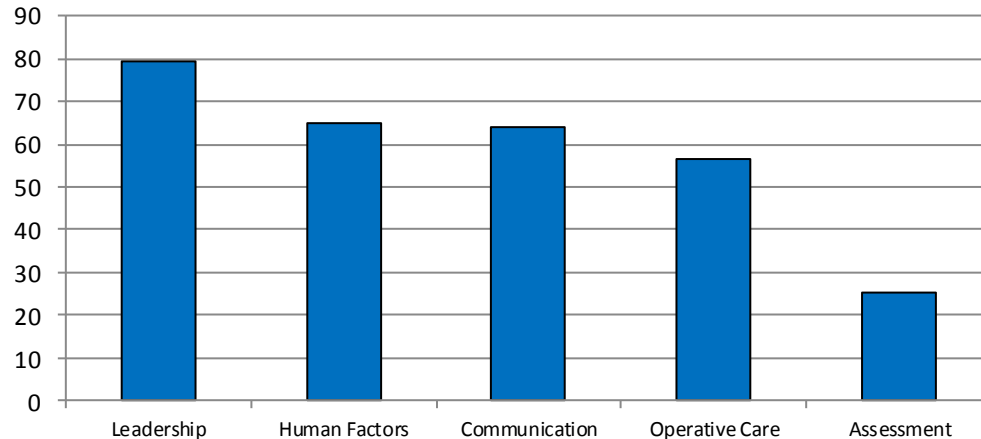
**Op/Post-op Complication Events  
Reviewed by The Joint Commission (N = 719)  
(Resulting in death or permanent loss of function)**



**Wrong-patient, wrong-site, Wrong-procedure  
Events Reviewed by The Joint Commission (N = 928)**



**Unintended Retention of Foreign Object Events  
Reviewed by The Joint Commission (N = 773)**



# Peri-operative Communication

- Communication failure is common
  - Study 1 = mean of 9 per case (range 3-18)
  - Study 2 = mean of 28 per case
  - 1 failure every 8 – 10 minutes of operative time
- Documented impact on safety and efficiency
- Failure most often related to purpose (46%), audience (34%), system of care (27%)
- Cross-disciplinary communication is more common than intra-disciplinary and the attending surgeon is most often involved.



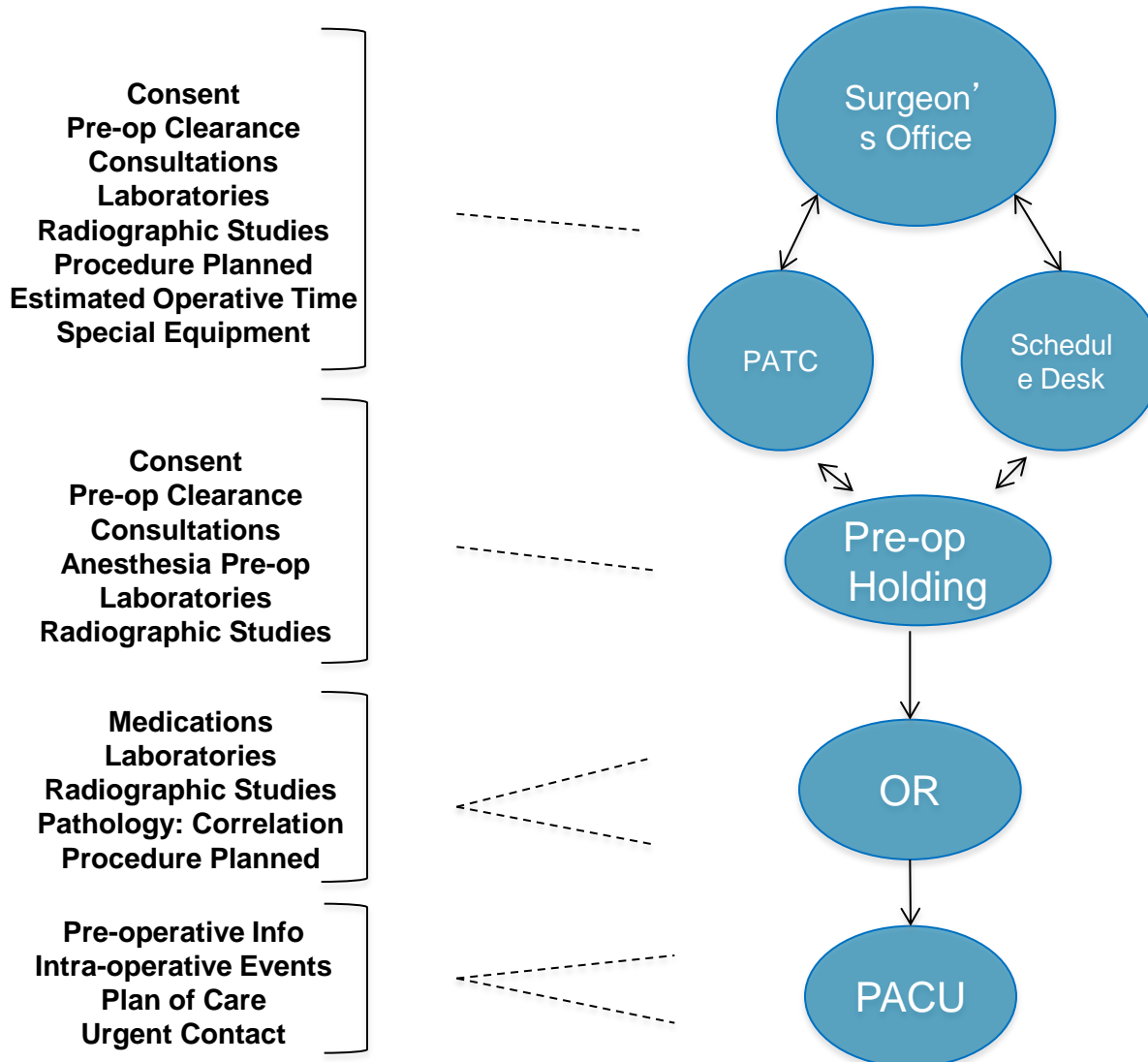
DEPARTMENT OF SURGERY

WiSOR

UNIVERSITY OF WISCONSIN

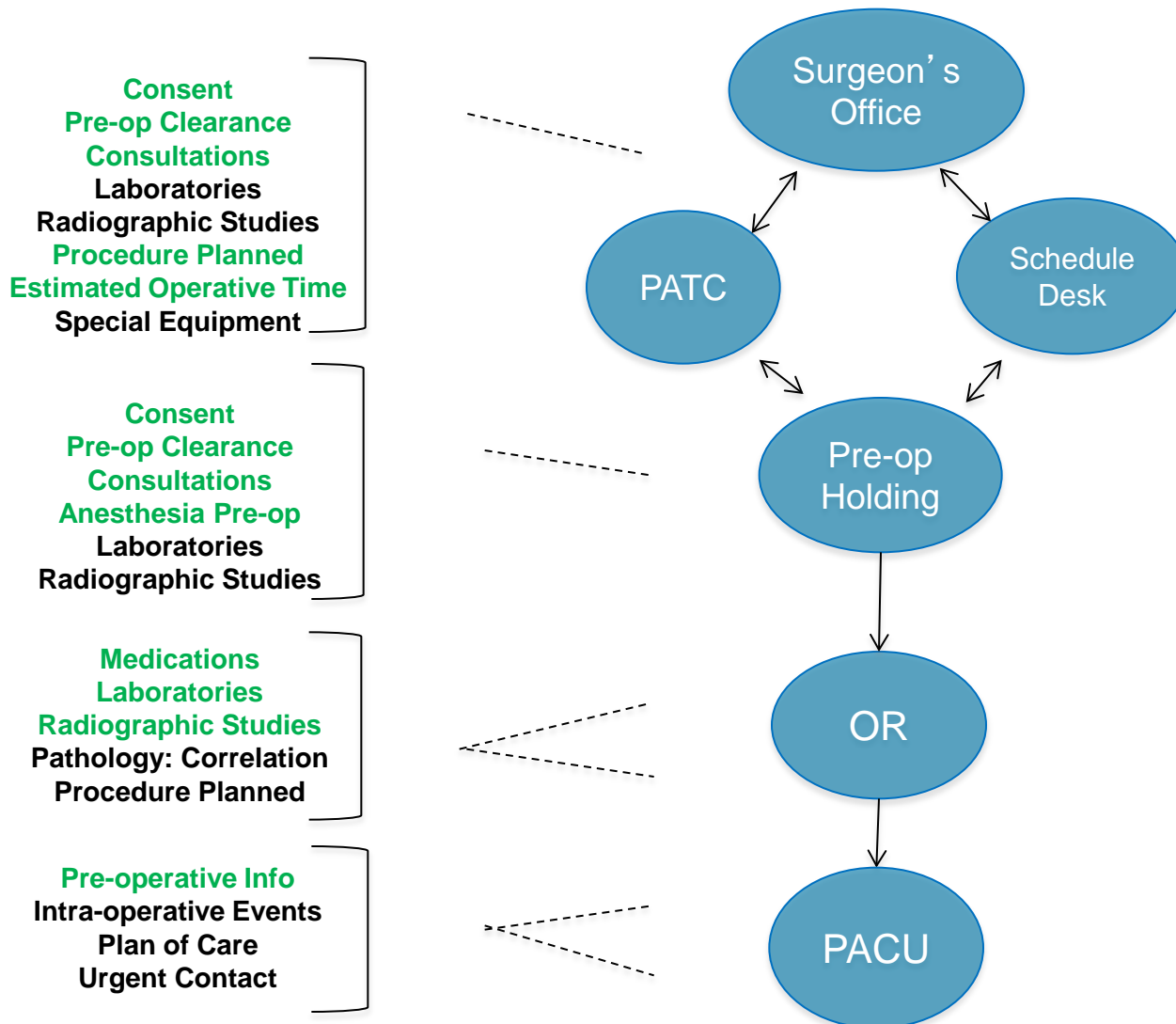
SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Forms of Information & Sites of Utilization

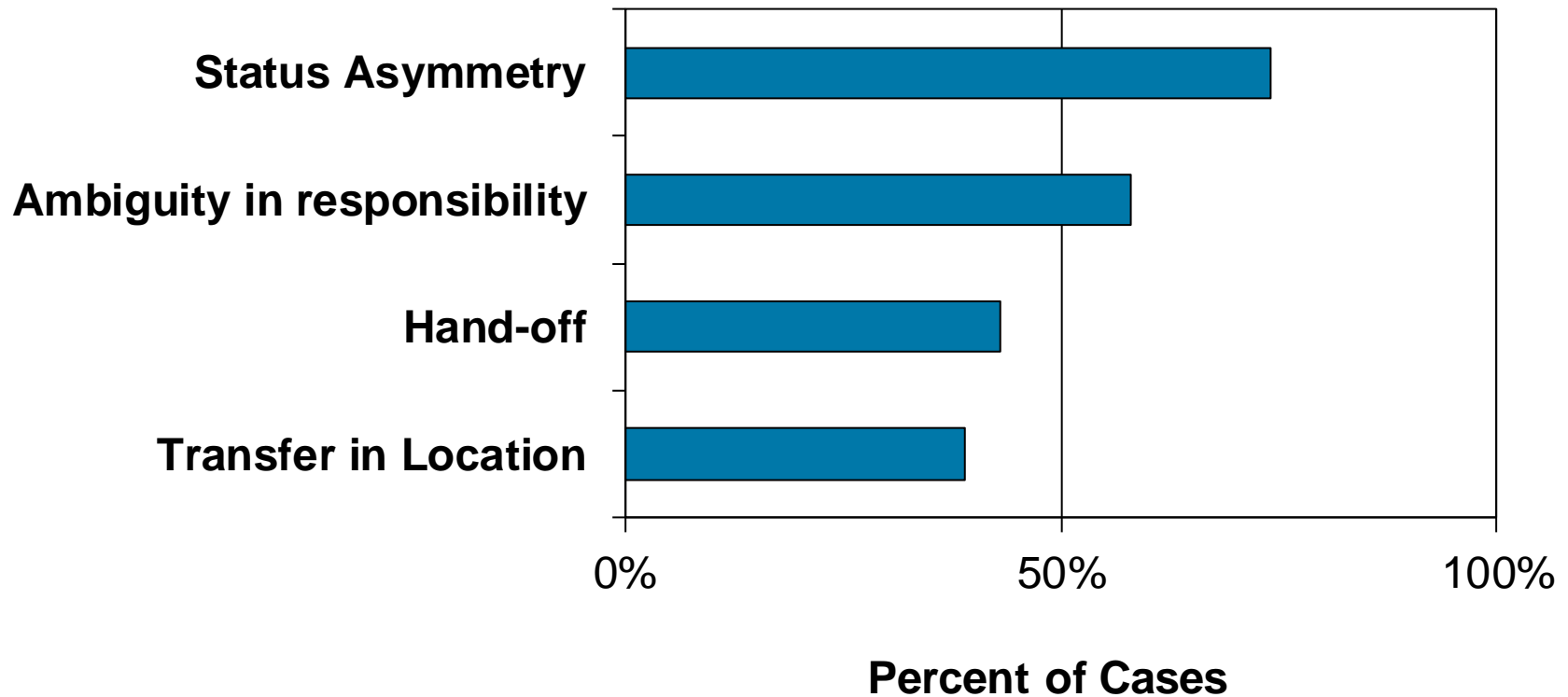




# Observed Sites of Vulnerability to Information Loss



# Contributing Factors



---

# A TEAM IS MORE THAN THE SUM OF ITS PARTS



DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# What is a team?

---

- Individuals (a) who see themselves and who are seen by others as a social entity, (b) who are interdependent because of the tasks they perform as members of a group

## Teams generally have...

- Task interdependence
- Distributed expertise and roles
- Hierarchically Organized
- Common goal



DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Groups vs. Teams

---

- In *groups* performance depends mostly on individual contributions. People might all have the same roles and skills.
- In *teams* skills are complimentary, roles are highly defined, members are mutually accountable to each other and need each other to succeed. They work toward a common goal and are interdependent.



DEPARTMENT OF SURGERY

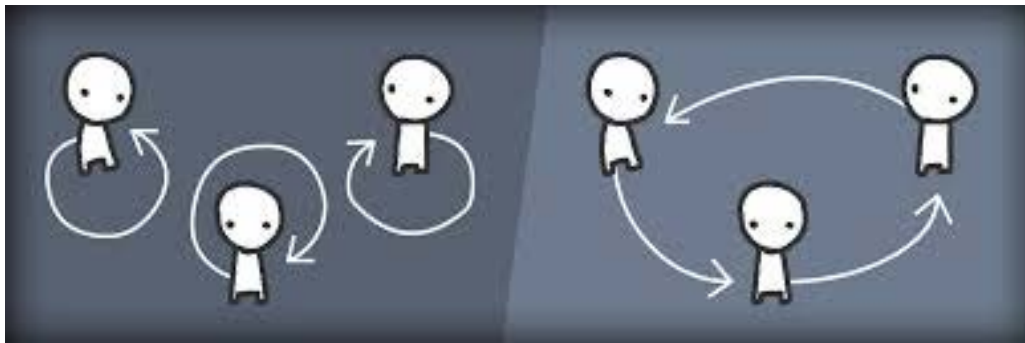
WiSOR

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

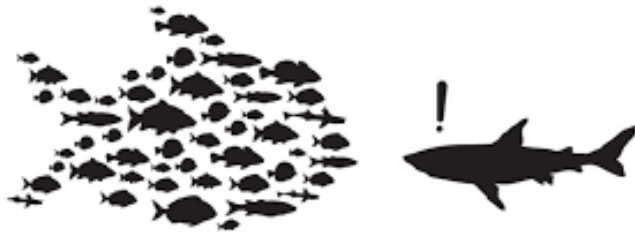
# Group vs. Team Performance

- In *groups* productivity may be only as good as the most productive individual.
- In *teams* productivity is an emergent property of teamwork and task work and therefore total productivity can be greater than individual parts.



# Taskwork vs. Teamwork

- Taskwork relates to member jobs
- Teamwork supports relationships and functional interactions
  - Communication, coordination, cooperation
  - Teamwork supports taskwork



**TEAMWORK**

©@searchingforpeople.com



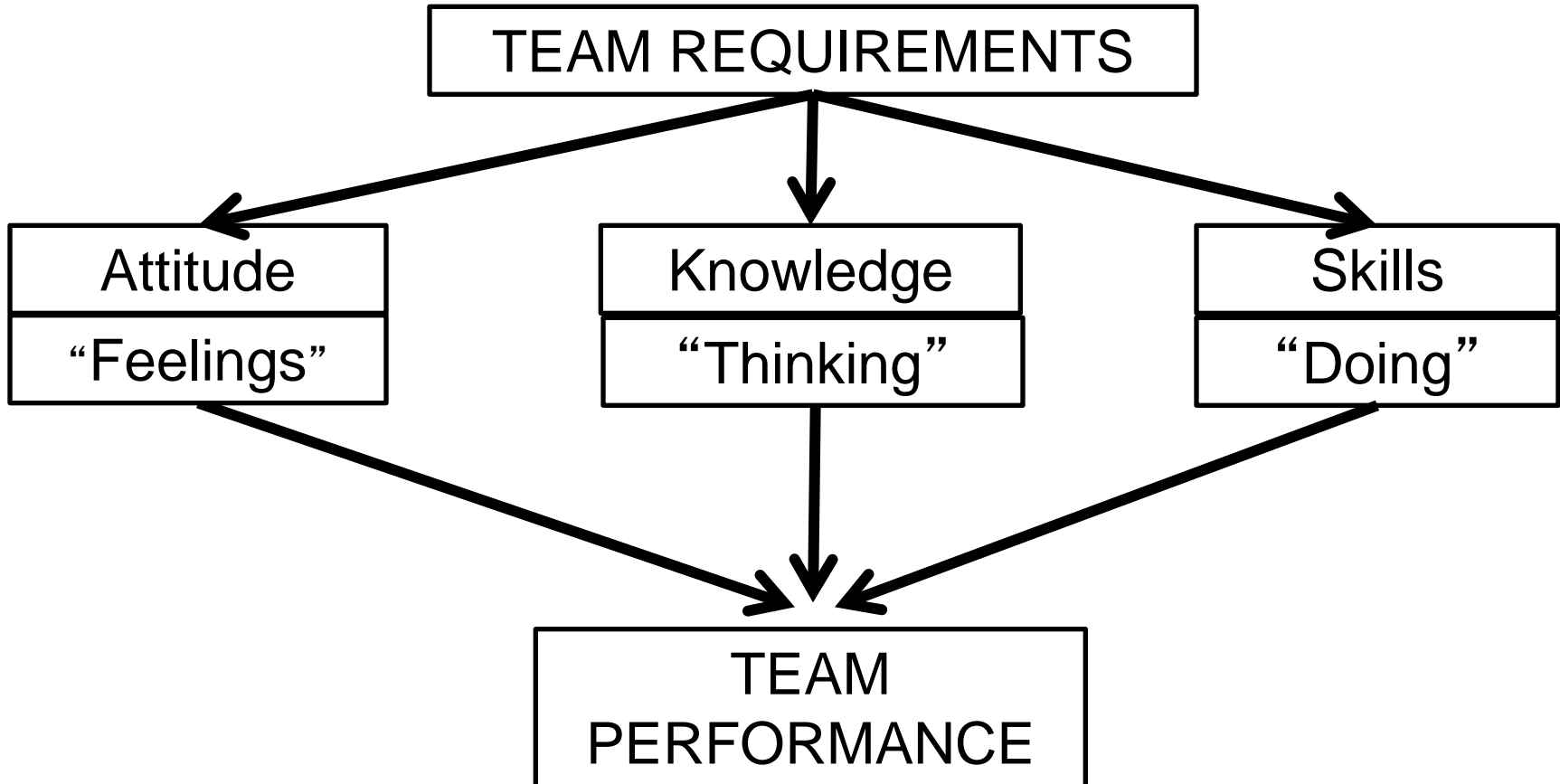
DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# What is required for effective teams?





# Attitude requirements

---

- Collective efficacy
- Shared vision
- Team cohesion
- Mutual trust
- Collective/team orientation
- Value of teamwork



# Knowledge requirements

---

- Shared Task Models; Situation Assessment
- Teammate Characteristics; Familiarity
- Knowledge of Team Mission; Objectives; Norms; Resources
- Roles and expectations
- Individual-task proficiency



# Skill requirements

---

- Mutual performance monitoring
- Supporting/Back-up behavior
- Team leadership
- Task-related assertiveness
- Conflict resolution
- Closed-loop communication



DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Building Good Teams

---

- Ensure team members know their role
- Ensure members know how their jobs intersect with other team members
- Set goals at the team-level as well as individual-level
- Provide timely individual and feedback on goals



DEPARTMENT OF SURGERY

WiSOR

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Frontline Perspectives

- Discipline-specific differences in team identity:
  - Nursing/ surgical techs: Other techs and nurses
  - Anesthesia: Anyone assisting in provision of anesthesia care - Pre-op nursing; block team; intra-op anesthesia providers including those giving breaks; surgeon; PACU nursing and anesthesiologist
  - Surgeons: “Sub-teams” for pre-, peri- and post-operative periods - Likely reflect longitudinal role of surgeon
- Surgeon as key player in “setting the tone” during room set-up/ operative time-out



---

# TRANSFORMATIONAL LEADERSHIP



DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Effective Teams and Leadership

---

- Are led by someone with good leadership skills, not just technical competence
- Have team members who believe the leaders cares about them
- Provide situation updates
- Foster teamwork, coordination and cooperation
- Leader self-corrects first



# Leadership

---

- Recognized by professional societies as a critical skill for surgeons
- Style impacts team performance
  - Transactional (task-oriented)
  - Transformational (team-oriented)
- Based on limited data, most surgeon leadership behaviors are task-based



DEPARTMENT OF SURGERY

WiSOR

UNIVERSITY OF WISCONSIN  
SCHOOL OF MEDICINE AND PUBLIC HEALTH



# Transactional vs. Transformational Leadership

Categories	Transactional	Transformational
Leader's source of power	Rank, position	Character, competence
Follower reaction	Compliance	Commitment
Time frame	Short term	Long term
Rewards	Pay, promotion, etc.	Pride, self-esteem, etc.
Supervision	Important	Less important
Performance Focus	Evaluation	Development
Where change occurs	Follower behavior	Follower attitude, values



# Surgeon Behaviors

Behaviors	Transaction.	Mix	Transformation.
Communicating	25%	14%	27%
Decision making	4%	6%	7%
Directing	27%	30%	9%
Maintaining standards	4%	1%	8%
Managing resources	21%	5%	7%
Socializing	4%	4%	7%
Supporting others	0%	1%	20%
Training	11%	39%	17%



# Surgeon Behaviors

Behaviors	Transaction.	Mix	Transformation.
Communicating	25%	14%	27%
Decision making	4%	6%	7%
Directing	27%	30%	9%
Maintaining standards	4%	1%	8%
Managing resources	21%	5%	7%
Socializing	4%	4%	7%
Supporting others	0%	1%	20%
Training	11%	39%	17%



# Communication Styles

Style	Transaction.	Mix	Transformation.
Argumentative	11%	6%	5%
Assured	11%	28%	14%
Expressive	4%	3%	0%
Precise	48%	53%	29%
Supportive	2%	10%	48%
Verbally aggressive	23%	0%	0%



# Communication Styles

Style	Transaction.	Mix	Transformation.
Argumentative	11%	6%	5%
Assured	11%	28%	14%
Expressive	4%	3%	0%
Precise	48%	53%	29%
Supportive	2%	10%	48%
Verbally aggressive	23%	0%	0%



# Transactional Leadership

---

- Enters OR
- Starts time-out while everyone is preoccupied with other tasks
- Pressures everyone to move faster
  - “Quick, quick, quick” (snapping)
  - “We gotta get going. Gotta fly here.”
- Gives specific directions about what he wants
  - “4 clips, 4 towels, regular drape, no loban, no chest press”



# Transformational Leadership

---

- Enters OR
- Greets everyone individually
  - “Good morning...I’m delighted to see you.”
- Communicates about case outside of time-out
  - “It’s going to be quite a day...Very straightforward, very simple.”
- Asks if ok to do time-out
  - “You guys ready for the blessing?”
- Starts time-out with introductions
- Asks if everyone ok with plan



# Impact on Team Performance

Team Behavior/Hr	Transaction.	Mix	Transformation.
Cooperation	5.4	10.7	10
Exhaustion	0.38	0	0
Information Sharing	33.1	31.1	36.7
Voice	3.1	13.0	15.6





---

# OPTIMIZING INTER-PERSONAL SKILLS AND TEAM COMMUNICATION



DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Teamwork Training

## (McCulloch, Rathbone, & Catchpole, 2011)

### Systematic review

#### Interventions to improve teamwork and communications among healthcare staff

P. McCulloch, J. Rathbone and K. Catchpole

Quality, Reliability, Safety and Teamwork Unit, Nuffield Department of Surgery, University of Oxford, Oxford, OX2 9DU, UK  
Correspondence: Mr P. McCulloch (e-mail: peter.mcculloch@nds.ox.ac.uk)

**Background:** Concern over the frequency of unintended harm to patients has focused attention on the importance of teamwork and communication in avoiding errors. This has led to experiments with teamwork training programmes for clinical staff, mostly based on aviation models. These are widely assumed to be effective in improving patient safety, but the extent to which this assumption is justified by evidence remains unclear.

**Methods:** A systematic literature review on the effects of teamwork training for clinical staff was performed. Information was sought on outcomes including staff attitudes, teamwork skills, technical performance, efficiency and clinical outcomes.

**Results:** Of 1036 relevant abstracts identified, 14 articles were analysed in detail: four randomised trials and ten non-randomised studies. Overall study quality was poor, with particular problems over blinding, subjective measures and Hawthorne effects. Few studies reported on every outcome category. Most reported improved staff attitudes, and six of eight reported significantly better teamwork after training. Five of eight studies reported improved technical performance, improved efficiency or reduced errors. Three studies reported evidence of clinical benefit, but this was modest or of borderline significance in each case. Studies with a stronger intervention were more likely to report benefits than those providing less training. None of the randomised trials found evidence of technical or clinical benefit.

**Conclusion:** The evidence for technical or clinical benefit from teamwork training in medicine is weak. There is some evidence of benefit from studies with more intensive training programmes, but better quality research and cost-benefit analysis are needed.

Paper accepted 17 December 2010

Published online 8 February 2011 in Wiley Online Library (www.interscience.wiley.com). DOI: 10.1002/tip.7434

### Introduction

There is widespread belief that the effectiveness of healthcare teams can be improved by specific training to improve interpersonal interaction and communication. This belief arises from a series of propositions. Modern high-technology healthcare is currently dangerous and unreliable, with a demonstrable high rate of unintentional harm to patients<sup>1-3</sup>. Analysis of incidents resulting in harm commonly highlights the central role of communication failure between members of the healthcare team<sup>4-6</sup>. Analysis of teamwork and communication in clinical teams identifies recurrent problems caused by hierarchical and cultural barriers<sup>5,7-9</sup>. Historically, aviation suffered from a similar safety and reliability problem in the 1950s and 1970s. Similar problems of culture and hierarchy were

identified as contributory to the communications failures resulting in major accidents<sup>10</sup>. The safety and reliability of aviation has improved markedly at the same time that mandatory human factors training for aircrew has become accepted throughout the industry.

These facts make the hypothesis plausible, but are far from conclusive. It is possible that aviation safety improved for reasons other than the efforts put into communications training, such as improved technology. It is possible that the contribution of poor teamwork to accidents leading to harm in medicine has been overestimated, because the nature of the available data makes quantification uncertain. It is also possible that the nature of modern clinical work nullifies against teamwork and good communications, and that specific training will therefore be ineffective. Training is likely to require considerable staff time and changes

*Conclusion: “The evidence for technical or clinical benefit from teamwork training in medicine is weak. There is some evidence of benefit from studies with more intensive training programmes [such as simulation], but better quality research and cost-benefit analysis are needed.”*

Training Guide: Using Simulation in TeamSTEPPS Training  
<http://www.ahrq.gov/teamstepstools/simulation/index.html>



# Pre-operative Briefings

## Development and Pilot Evaluation of a Preoperative Briefing Protocol for Cardiovascular Surgery

Sarah E Henrickson, MA, Rishi K Wadhwa, BS, Andrew W ElBardissi, MD, MPH,  
Douglas A Wiegmann, PhD, Thoralf M Sundt III, MD

**BACKGROUND:** Preprocedural briefings have been adopted in many high consequence environments, but have not been widely accepted in medicine. We sought to develop, implement, and evaluate a preoperative briefing for cardiovascular surgery.

**STUDY DESIGN:** The briefing was developed by using a combined questionnaire and semistructured focus group approach involving five subspecialties of surgical staff (n = 55). The results were used to design and implement a preoperative briefing protocol. The briefing was evaluated by monitoring surgical flow disruptions, circulating nurse trips to the core, time spent in the core, and cost-waste reports before and after implementation of the briefing across 16 cardiac surgery cases.

**RESULTS:** Focus group data indicated consensus among surgical staff concerning briefing benefits, duration, location, content, and potential barriers. Disagreement arose concerning timing of the brief and the roles of key participants. After implementation of the briefing, there was a reduction in total surgical flow disruptions per case (5.4 preimplementation versus 2.8 postimplementation,  $p = 0.004$ ) and reductions in per case average of procedural knowledge disruptions (4.1 versus 2.17,  $p = 0.004$ ) and miscommunication events (2.5 versus 1.17,  $p = 0.03$ ). There was no significant reduction in disruptions because of equipment preparation or disruptions from patient-related issues. On average, briefed teams experienced fewer trips to the core (10 versus 4.7,  $p = 0.004$ ) and spent less time in the core (397.4 seconds versus 172.3 seconds,  $p = 0.006$ ), and there was a trend toward decreased waste (30% versus 17%,  $p = 0.15$ ).

**CONCLUSIONS:** These findings demonstrate the feasibility of creating a specialty-specific preoperative briefing to decrease surgical flow disruptions and improve patient safety in the operating room. (J Am Coll Surg 2009;208:1115–1123. © 2009 by the American College of Surgeons)

Effective communication and teamwork have been recognized as critical drivers of quality and safety in many "high consequence" industries. High consequence industries are those in which critical procedures are conducted in environments of high complexity and failure is potentially catastrophic.<sup>1</sup> Effective communication is particularly critical when processes are "tightly coupled" such that failures in one subsystem are directly reflected or even amplified in others, as may be the case in surgery. In health care specif-

ically, there is increasing recognition that breakdowns in communication or teamwork are causal factors in as many as 65% sentinel events, as per the Joint Commission.<sup>2</sup> Within the surgical domain, one analysis demonstrated incomplete, nonexistent, or erroneous communication to be a causal factor in 43% of errors.<sup>3</sup> Examined conversely, a study specifically of communication errors demonstrated that 36% of communication errors in the operating room resulted in team tension, resource waste, work-arounds, inefficiency, delays, patient inconvenience, and procedural errors.<sup>4</sup> The same study also showed that as many as 30% of operating room communications fail in one regard or another, either because of poor timing (46%), inaccurate or incomplete information (36%), issues remaining unresolved (24%), or failure to include key personnel (21%). In 33% of these failures there are effects that increase cognitive work load, interrupt routine, or increase tension.<sup>4</sup>

Preprocedural briefings are commonplace in many high consequence industries. Accordingly, it is not surprising

*The goal of this project was to "...develop, implement, and evaluate a preoperative briefing for cardiovascular surgery."*

*"After implementation..., there was a reduction in total surgical flow disruptions per case including miscommunication events ... On average, briefed teams experienced fewer trips to the core and spent less time in the core ...and there was a trend toward decreased waste ."*

Disclosure Information: Nothing to disclose.

Received October 29, 2008; Accepted January 15, 2009.

From the Division of Cardiovascular Surgery (Henrickson, Sundt) and the College of Medicine (Wadhwa), Mayo Clinic, Rochester, MN; the Institute of Public Health, University of Cambridge, Cambridge, England (Wadhwa); the Department of Surgery, Brigham and Women's Hospital, Boston, MA (ElBardissi); and the Department of Industrial and Systems Engineering, University of Wisconsin-Madison, Madison, WI (Wiegmann).

Correspondence address: Sarah E Henrickson, MA, Mayo Clinic, 200 First St SW, Rochester, MN 55905.



# Standardization of Communication

## Development and Pilot Evaluation of a Preoperative Briefing Protocol for Cardiovascular Surgery

Sarah E Henrickson, MA, Rishi K Wadhra, BS, Andrew W ElBardissi, MD, MPH, Douglas A Wiegmann, PhD, Thoralf M Sundt III, MD

**BACKGROUND:** Preprocedural briefings have been adopted in many high consequence environments, but have not been widely accepted in medicine. We sought to develop, implement, and evaluate a

Acquired Cardiovascular Disease

Wadhra et al

### Is the “sterile cockpit” concept applicable to cardiovascular surgery critical intervals or critical events? The impact of protocol-driven communication during cardiopulmonary bypass

Rishi K. Wadhra, BS,<sup>a</sup> Sarah Henrickson Parker, MS,<sup>b</sup> Harold M. Burkhardt, MD,<sup>a</sup> Kevin L. Greason, MD,<sup>a</sup> James R. Neal, CCP,<sup>a</sup> Katherine M. Levenick, CCP,<sup>a</sup> Douglas A. Wiegmann, PhD,<sup>a</sup> and Thoralf M. Sundt III, MD<sup>a</sup>

**Objective:** There is general enthusiasm for applying strategies from aviation directly to medical care; the application of the “sterile cockpit” rule to surgery has accordingly been suggested. An implicit prerequisite to the evidence-based transfer of such a concept to the clinical domain, however, is definition of periods of high mental workload analogous to takeoff and landing. We measured cognitive demands among operating room staff, mapped critical events, and evaluated protocol-driven communication.

**Methods:** With the National Aeronautics and Space Administration Task Load Index and semistructured focus groups, we identified common critical stages of cardiac surgical cases. Intraoperative communication was assessed before ( $n = 18$ ) and after ( $n = 16$ ) introduction of a structured communication protocol.

**Results:** Cognitive workload measures demonstrated high temporal diversity among caregivers in various roles. Eight critical events during cardiopulmonary bypass were then defined. A structured, unambiguous verbal communication protocol for these events was then implemented. Observations of 18 cases before implementation including 29.6 hours of cardiopulmonary bypass with 632 total communication exchanges (average 35.1 exchanges/case) were compared with observations of 16 cases after implementation including 23.9 hours of cardiopulmonary bypass with 748 exchanges (average 46.8 exchanges/case,  $P = .06$ ). Frequency of communication breakdowns per case decreased significantly after implementation (11.5 vs 7.3 breakdowns/case,  $P = .008$ ).

**Conclusions:** Because of wide variations in cognitive workload among caregivers, effective communication can be structured around critical events rather than defined intervals analogous to the sterile cockpit, with reduction in communication breakdowns. (*J Thorac Cardiovasc Surg* 2010;139:312-9)

Effective communication is a critical precondition of effective teamwork and high-reliability performance in high-risk and high-consequence environments such as the cardiac surgical operating room (OR). It is therefore not surprising that breakdowns in communication in the OR have been linked to worse surgical outcomes.<sup>1,2</sup> In an interview study of consultant surgeons, incomplete, nonexistent, or erroneous communication was a causal factor in 43% of surgical adverse events,<sup>3</sup> and a recent surgeon review of 444 surgical malpractice claims identified 81 communication breakdowns among 60 of these claims, 92% of which were verbal interchanges or events.<sup>4</sup>

Unfortunately, ineffective communication is not uncommon in the OR. In an observational study of general and vascular surgical ORs, Lingard and colleagues<sup>5</sup> documented

“communication failures,” as defined by poor timing, inaccurate or incomplete information, failure to include key team members or failure to resolve issues, in 31% of OR communications. A third of these failures resulted in demonstrable inefficiency, increased cognitive workload, interruption of flow, and increased tension, as well as wasted resources. Despite their negative impact on the work environment, such failures may remain unresolved, because staff members often use process work-arounds that may solve immediate challenges but do not address long-term systemic inadequacies.<sup>6</sup> Specifically, within the domain of cardiovascular surgery, our group has previously shown that communication failures adversely affect technical surgical performance.<sup>7</sup> Unfortunately, consistent with the observations of others, we have also found that only a third of nonphysician caregivers in our ORs consider surgeon communication to be effective.<sup>8,9</sup>

The cardiovascular surgical OR is clearly a high-consequence environment; it is also a high-risk environment

*“Intraoperative communication was assessed before ( $n = 18$ ) and after ( $n = 16$ ) introduction of a structured communication protocol... Frequency of communication breakdowns per case decreased significantly after implementation.”*



DEPARTMENT OF SURGERY  
**WiSOR**  
UNIVERSITY OF WISCONSIN  
SCHOOL OF MEDICINE AND PUBLIC HEALTH

Effect  
nized  
conseq  
those  
ronm  
astrop  
when  
one st  
others

Disclos  
Receive  
From th  
College  
of Publ  
the Dep  
(ElBard  
Univers  
Corresp  
SW, Ro

© 2009  
Publish

From the Mayo Clinic,<sup>a</sup> Rochester, Minn; the University of Aberdeen,<sup>b</sup> Aberdeen, Scotland; and the University of Wisconsin-Madison,<sup>c</sup> Madison, Wis.  
Disclosures: None.

# Team Familiarity

## Development and Pilot Evaluation of a Preoperative Briefing Protocol for Cardiovascular Surgery

Sarah E Henrickson, MA, Rishi K Wadhra, BS, Andrew W ElBardissi, MD, MPH, Douglas A Wiegmann, PhD, Thoralf M Sundt III, MD

Acquired Cardiovascular Disease

Wadhra et al

### Is the “sterile cockpit” concept applicable to cardiovascular surgery critical intervals or critical events? The impact of protocol-driven communication during cardiopulmonary bypass

Rishi K. Wadhra, BS,<sup>1</sup> Sarah Henrickson Parker, MS,<sup>2</sup> Harold M. Burkhart, MD,<sup>3</sup> Kevin L. Gresson, MD,<sup>4</sup> James R. Neal, CCP,<sup>5</sup> Katherine M. Levenick, CCP,<sup>6</sup> Douglas A. Wiegmann, PhD,<sup>7</sup> and Thoralf M. Sundt III, MD<sup>8</sup>



European Journal of Cardio-thoracic Surgery 34 (2008) 1027–1033

DEPARTMENT OF  
CARDIO-THORACIC  
SURGERY

www.elsevier.com/locate/ijot

### Identifying methods to improve heart surgery: an operative approach and strategy for implementation on an organizational level<sup>1,2</sup>

Andrew W. ElBardissi<sup>3a,\*</sup>, Douglas A. Wiegmann<sup>3</sup>, Sarah Henrickson<sup>5</sup>, Rishi Wadhra<sup>6</sup>, Thoralf M. Sundt III<sup>8</sup>

<sup>1</sup>Department of Surgery, Brigham and Women's Hospital, Harvard Medical School, 75 Francis Street, Boston, MA 02115, United States

<sup>2</sup>Department of Industrial and Systems Engineering, University of Wisconsin-Madison, Madison, WI, United States

<sup>3</sup>Division of Cardiovascular Surgery, Mayo Clinic, Rochester, MN, United States

Received 3 April 2008; received in revised form 1 July 2008; accepted 2 July 2008; available online 8 August 2008

#### Abstract

**Background:** Previous research has found teamwork failures to be strongly associated with the occurrence of surgical error. There have been few efforts to prospectively collect data regarding teamwork failures and technical errors in order to create interventions that would maximize teamwork effectiveness thereby minimizing technical error. **Methods:** Thirty-one cardiac surgical cases were prospectively observed by a trained human factors observer. Events were characterized according to human factors theory and included teamwork failures and technical errors. **Surgical team structure** was also evaluated in an effort to identify if it had an impact on surgical team performance. **Results:** A strong correlation ( $r = 0.67, p < 0.001$ ) was recognized between the occurrence of technical error ( $n = 155$ ) and teamwork failures ( $n = 178$ ). Teamwork failures consisted of surgeon–technical team failures ( $n = 90, 51\%$ ), procedural information failures ( $n = 36, 20\%$ ), surgeon–anesthesiologist failures ( $n = 27, 15\%$ ), surgeon–perfusist failures ( $n = 18, 10\%$ ), and failures due to handoffs ( $n = 7, 4\%$ ). Teams made up of members that were familiar with the operating surgeon had significantly fewer total event failures ( $8.6 \pm 1.6$  vs  $22 \pm 3.1, p < 0.0001$ ) and teamwork failures ( $5.6 \pm 1.8$  vs  $15.4 \pm 1.9, p < 0.0001$ ) in comparison to those teams where the majority of members were unfamiliar with the operating surgeon. **Conclusions:** These results indicate that the process of cardiac surgery would benefit from interventions to improve teamwork and communication. Such interventions could include preoperative briefings, revised approach to structuring of operative teams to favor members that have gained familiarity with the operating surgeon, standardized communication practices, and postoperative debriefings.

© 2008 European Association for Cardio-Thoracic Surgery. Published by Elsevier B.V. All rights reserved.

**Keywords:** Patient safety; Error; Human factors; Teamwork; Communication

#### 1. Introduction

As the complexity of the practice of cardiac surgery increases due to increasing comorbidities of patients and the introduction of advanced technologies, the achievement and maintenance of surgical excellence has become more challenging. In fact while there has been significant reduction in the morbidity and mortality after cardiac surgery since its inception over 50 years ago, there continues

human factors that is built upon these core concepts which focuses on integrating human capabilities and limitations into the design of work systems. Cardiac surgical care, therefore, could be improved by introducing effective error management approaches including efforts to reduce the frequency of errors, increase their capture, and enhance the ability to compensate for them when they occur.

Our work focuses on investigating team dynamics by applying human factor principles used in high consequence

*“Teams made up of members that were familiar with the operating surgeon had significantly fewer... total teamwork failures in comparison to those teams where the majority of members were unfamiliar with the operating surgeon.”*



DEPARTMENT OF SURGERY  
**WiSOR**

UNIVERSITY OF WISCONSIN  
SCHOOL OF MEDICINE AND PUBLIC HEALTH

---

# TEAM FLUIDITY



DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN  
SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Team Fluidity

- The OR is a high risk environment
- Many surgical AEs involve a breakdown in teamwork or communication
  - Interventions have been adapted from other disciplines
  - No consideration of differences in OR teams
- Exacerbated by use of surgical teams with changing (fluid) membership and intra-operative hand-offs
  - No real assessment of frontline providers' perceptions
  - No assessment of the confluence of unfamiliarity, hand-offs, communication



DEPARTMENT OF SURGERY

WiSOR

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

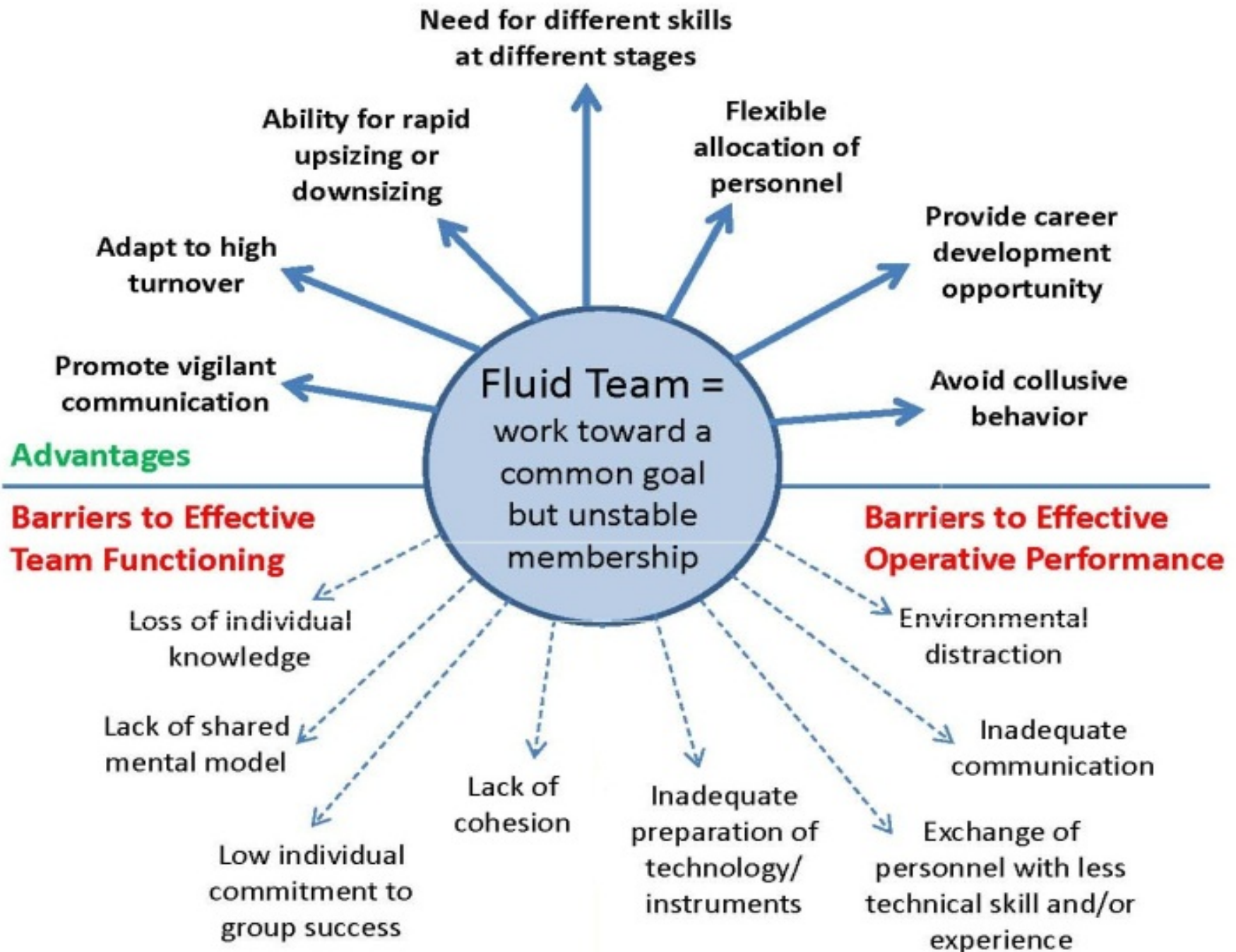
# Definitions

---

- Intra-Operative Hand-off
  - The exchange of personnel in which one person transfers control over, or responsibility for, the performance of specific tasks associated with the surgical care of a patient and then departs the OR
- Team Fluidity
  - Members are considered interchangeable based on roles
  - Team membership is unstable







# Methods

---

- Focus groups:
  - 6 to 8 providers
  - Separate for each discipline of interest (nursing, surgery, anesthesia)
  - Semi-structured format lasting approximately an hour
- Facilitated by systems engineer experienced with operating rooms and patient safety
- Analysis
  - Audio recorded, transcribed, and de-identified
  - Inductive qualitative analysis using constant comparative method



DEPARTMENT OF SURGERY

WiSOR

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Results: The Ideal Hand-Off

- No consensus
- Some providers felt it should be unobtrusive and confined to a single discipline

*“You never really notice when a good transition happens... the best transition would be one that’s seamless and not even noticed.” (Surgery)*

- Others felt it should include a notification to the rest of the room

*“... a surgeon mentioned to me that they really, really appreciate when you leave, you say, [this person] is relieving me now’.... Just to let them know.” (Nursing)*



# Results: The Ideal Hand-Off

---

- The hand-off may represent an opportunity to re-anchor the entire room

*“... if the circulator wasn’t necessarily sure what’s going on deep in the hole ... the surgeon could overhear that and be like, ‘oh no we’re going to be doing this,’ it kind of brings everyone back in the whole room.” (Surgery)*



DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN  
SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Results: “Setting the Tone”

- Emerged empirically from the data
- Surgeons’ behavior in the pre-operative period and during the time-out can “set the tone” for the rest of the case

*“When a surgeon will verbally say, [nurse’s name], do you have everything that you need today?’ Or [tech’s name] do you have everything that you need?’ ... It’s nice when they acknowledge, I have a nurse and I have a tech and I need them to do my case... So I think that can definitely set the tone of a room.” (Nursing)*

*“I’ve noticed a very stark difference when you go into the room. If there’s somebody that you don’t know, if you introduce yourself it changes the entire tone of the room ... and the nurses are willing to ... voluntarily be part of your team instead of being forced to be in that room that day.” (Surgery)*



DEPARTMENT OF SURGERY

WiSOR

UNIVERSITY OF WISCONSIN  
SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Results: Managing Unfamiliarity

---

- In all disciplines, providers agreed that the presence of unfamiliar team members required increased verbal communication

*“I think a lot more communication needs to happen.”* (Nursing)

*“I try to be very clear about what it is that I want or I think is going on... and communicate that more in layman’s terms”* (Anesthesia)

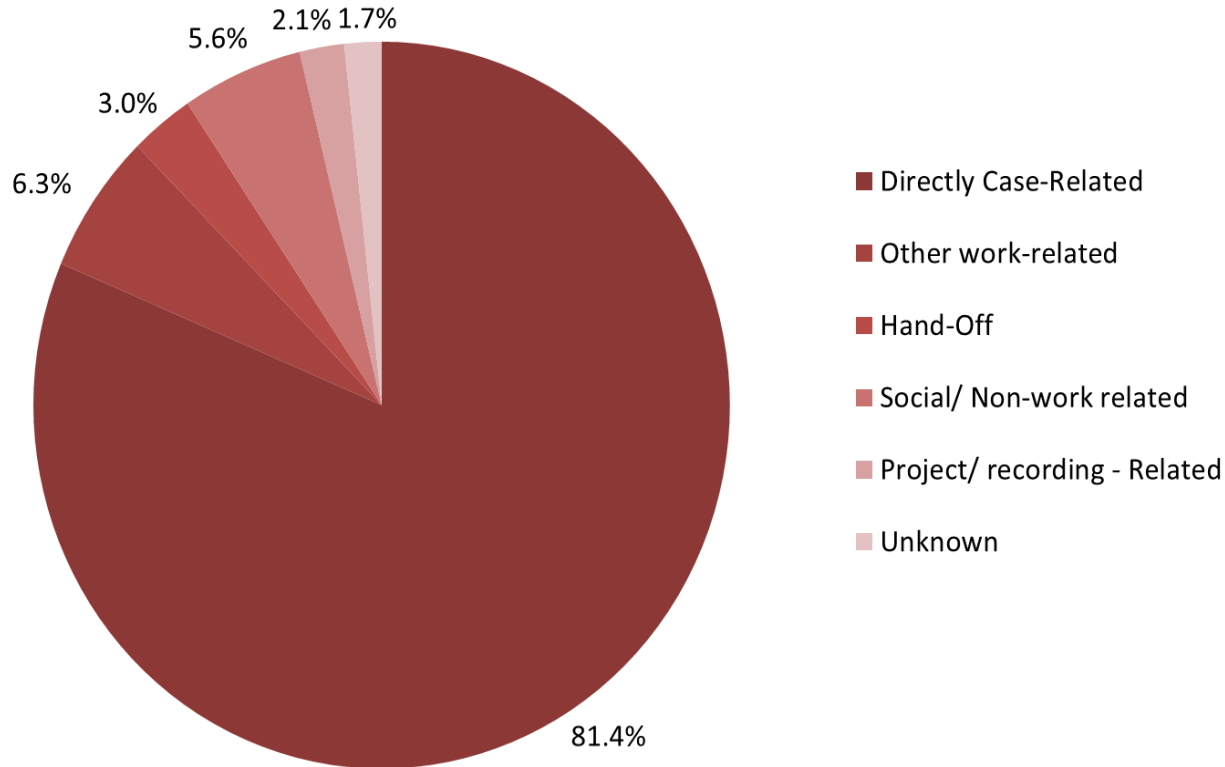


# AV Recording

- Screen inpatient OR schedule
- Inclusion criteria:
  - Open operation
  - Case estimated >3 hours
- Record case from room set-up to patient exit
  - GoPros x2
  - Sports glasses x1 (surgeon)

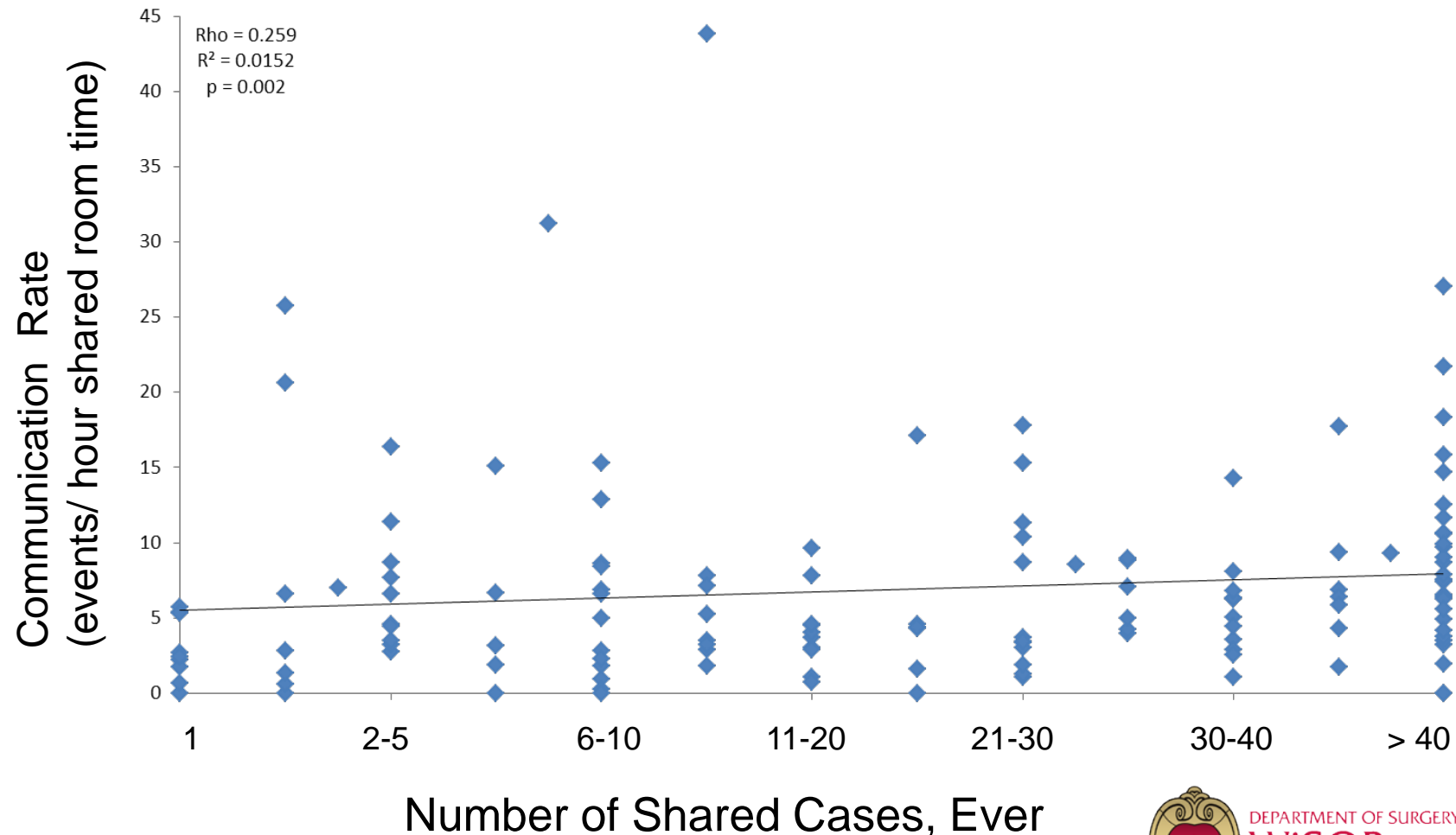


# Communication Event Content





# Familiarity and Communication Rates, All Dyads



# Poisson Regression

**Table 3. Predictors of Dyad Communication Rate Using Poisson Regression.**

<b>Predictor</b>	<b>IRR (95% Confidence Interval)</b>	<b>Predicted Average Communication Rate (events/ h shared room time)</b>
Familiarity Score	1.02 (0.94, 1.09)	-
Across-Sex Dyad Status		
MM (N=42)	-	4.7
FF (N=29)	1.11 (0.81, 1.51)	5.2
MF (N=74)	1.37 (1.11, 1.84)	6.4
Cross-Discipline Dyad Status	-	
ID (N=28)	-	10.0
AN (N=35)	0.28 (0.18, 0.43)	2.8
AS (N=37)	0.52 (0.37, 0.74)	5.2
NS (N=37)	0.58 (0.44, 0.77)	5.8

IRR, Incident Rate Ratios; MM, Male-Male; FF, Female-Female; MF, Male-Female; ID, intra-disciplinary; AN, Anesthesiology-Nursing; AS, Anesthesiology-Surgery; NS, Nursing-Surgery



DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

---

# FINAL THOUGHTS



DEPARTMENT OF SURGERY

**WiSOR**

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Simple Things to Consider

---

- Introduce yourself to new or unfamiliar personnel
- Consider writing names on the white board so you can identify your audience for verbal communication
- Ask team to call you by your first name
- Encourage your team to speak up if they have a concern
- Standardize “things” that don’t really matter to decrease cognitive workload
- Seek feedback from your colleagues on your style – 360 degree evaluations
- Consider leadership training or coaching



# Conclusions

---

- Communication is a major contributor to poor patient outcomes in surgery
- The surgeon plays a critical role in “setting the tone” in the OR
- Interpersonal and leadership style is a critical determinant of team behavior in the OR
- There are simple things that you can do tomorrow to improve your interpersonal skills and team communication that can have major impact on patient safety, operative efficiency, and provider burn out





DEPARTMENT OF SURGERY

# Wisconsin Surgical Outcomes Research Program

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

# Thank You

[greenberg@surgery.wisc.edu](mailto:greenberg@surgery.wisc.edu)