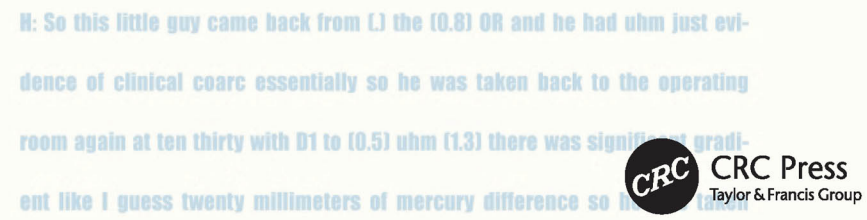
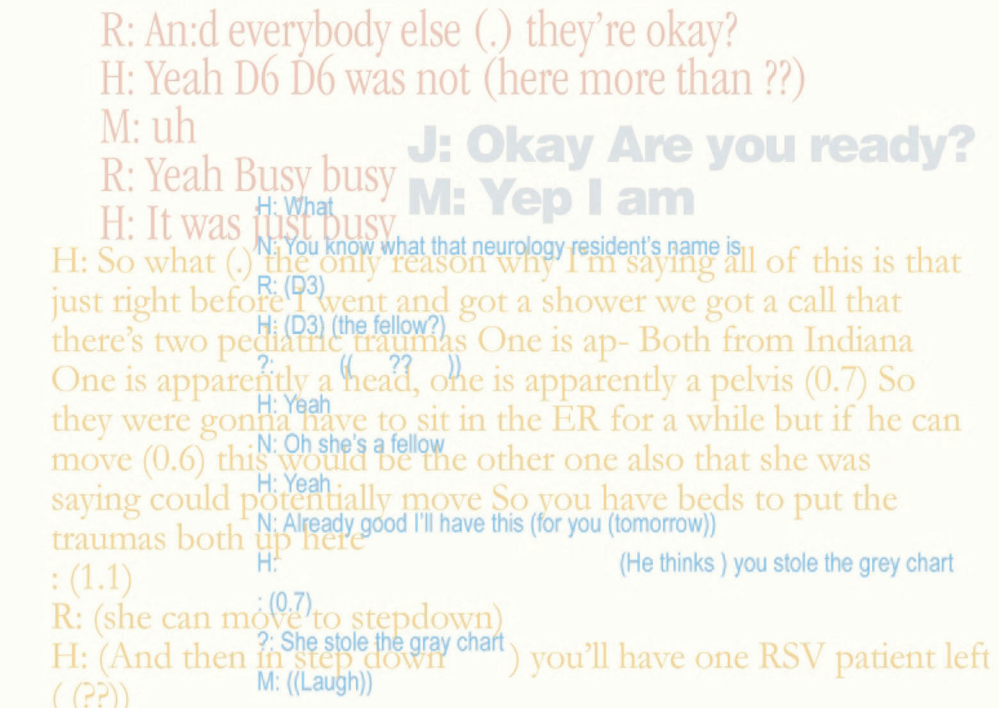


Improving Healthcare Team Communication

Building on Lessons from Aviation and Aerospace

Edited by Christopher P. Nemeth



IMPROVING HEALTHCARE TEAM COMMUNICATION

For those who serve in healthcare

Improving Healthcare Team Communication

Building on Lessons from Aviation and Aerospace

Edited by

CHRISTOPHER P. NEMETH
The University of Chicago, USA

Routledge
Taylor & Francis Group
LONDON AND NEW YORK

First published 2008 by Ashgate Publishing

Published 2016 by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN
711 Third Avenue, New York, NY 10017, USA

Routledge is an imprint of the Taylor & Francis Group, an informa business

British Library Cataloguing in Publication Data
Improving healthcare team communication : building on
lessons from aviation and aerospace
1. Health care teams 2. Communication in medicine
I. Nemeth, Christopher P.
362.1'068

Library of Congress Cataloging-in-Publication Data
Improving healthcare team communication : building on lessons from aviation and aerospace / [edited] by Christopher P. Nemeth.
p. cm.
Includes bibliographical references and index.
ISBN 978-0-7546-7025-4 (hardback : alk. paper)
1. Health care teams. 2. Communication in medicine. I. Nemeth, Christopher P.
[DNLM: 1. Communication. 2. Patient Care Team. 3. Group Processes. 4. Interprofessional Relations. 5. Risk Management. W 84.8 I34 2008]

R729.5.H4I47 2008
362.1--dc22

2007046577

ISBN: 978-0-7546-7025-4 (hbk)
ISBN: 978-1-3155-8805-6 (ebk)

Contents

PART 3: HEALTHCARE TEAM COMMUNICATION IN THE FIELD

PART 4: FUTURE TRENDS

List of Figures

List of Tables

This page intentionally left blank

Notes on Contributors

Charles E. Billings is affiliated with the Cognitive Systems Engineering Laboratory at the Ohio State University. He is a Clinical Professor Emeritus in Preventive Medicine at the Ohio State University and a Fellow of the Aerospace Medical Association and the Royal Aeronautical Society. Prior to returning to the University, he was chief scientist at the NASA Ames Research Center, where in 1975 he and his colleagues developed and implemented the NASA Aviation Safety Reporting System (ASRS).

Adelaïde Blavier has a PhD in psychology and works as a senior researcher thanks to a grant of the Belgian National Fund of Scientific Research at the Department of Cognitive Ergonomics (Prof. AS Nyssen) of the University of Liège, Belgium. With a background in neuropsychology and cognitive psychology, her domain of research concerns the visual perception and more specifically, the depth perception, visual attention and eye movements, in relation to human errors in complex systems.

Marianne J. Brandwijk, MD practices Pediatric Critical Care Medicine. While performing her fellowship in pediatric critical care at The University of Chicago Medical Center, Dr. Brandwijk studied how clinicians perform cognitive work in the Pediatric Intensive Care Unit (PICU) with particular attention to technical work issues.

Jeffrey P. Brown, MEd, is engaged in patient safety research and improvement initiatives concerned with interdisciplinary decision making and teamwork. In 2002, he joined a cardiac surgery care team in receiving a John M. Eisenberg Patient Safety Award for System Innovation from the Joint Commission and the National Quality Forum. He served as advisor and consultant in the development of an interdisciplinary decision-making methodology that significantly improved the safety and quality of care for post-operative open heart surgery patients. His affiliations include Klein Associates Division of Applied Research Associates and the University System of New Hampshire, USA. Prior to 1996, he served as a faculty member and department chair for university aviation programs. He has authored and co-authored a number of articles and book chapters on patient safety. Brown earned his MEd and BS degrees from the University of Maine.

Richard I. Cook, MD is a physician, educator, and researcher at the University of Chicago. His current research interests include the study of human error, the role of technology in human expert performance, and patient safety. He is internationally recognized as a leading expert on medical accidents, complex system failures, and human performance at the sharp end of these systems. Dr. Cook's most often cited publications are 'Gaps in the continuity of patient care and progress in patient safety', 'Operating at the Sharp End: The complexity of human error', 'Adapting to New Technology in the Operating Room', and the report 'A Tale of Two Stories:

Contrasting Views of Patient Safety.' Dr. Cook regularly practices clinical procedures at various sites in the University of Chicago Medical Center. Home page : <http://www.ctlab.org/Cook.cfm>

Brian Cuthbertson (MD, FRCA) is a Senior Lecturer in Anaesthesia and Intensive Care at the University of Aberdeen. His research interests include the improvement of patient outcomes from critical illness, with investigations focusing upon patient safety, teamwork, the early recognition of critical illness, and quality of life after ICU care.

Eric M. Eisenberg, PhD, is Professor of Communication at the University of South Florida. He received his doctorate from Michigan State University in 1982. Dr Eisenberg twice received the National Communication Association Award for the outstanding research publication in organizational communication, as well as the Burlington Foundation award for excellence in teaching. He is also the recipient of the Ohio University Elizabeth Andersch Award for significant contributions to the field of communication. Dr Eisenberg is the author of over 75 articles, chapters, and books on the subjects of organizational communication, health communication, and communication theory. His best-selling textbook *Organizational Communication: Balancing Creativity and Constraint* (currently in its fifth edition) received the Academic Textbook Author's "Texty" award for the best textbook of the year. He is an internationally recognized researcher, teacher, and consultant specializing in the strategic use of communication to promote positive organizational change. Home page: <http://www.cas.usf.edu/communication/eisenberg/index.html>.

Rod Elford, BPE, MD, CCFP, MSc, is the first Canadian physician to complete formal training in telehealth, specifically a two-year international clinical research fellowship in telemedicine and a master's degree in child telepsychiatry. He is a founding member of the Canadian Society of Telehealth and the International Society for Telemedicine. Dr Elford is the co-founder and director of Digital Telehealth Incorporated and has worked as a telemedicine consultant for many organizations, including the Canadian Space Agency. He is a Clinical Assistant Professor at the University of Calgary, associated with the Centre for Health Information Technology Innovation. Currently, Dr Elford is the Medical Director for Health Link Alberta, a province-wide health call center. He continues to practice as an urgent care physician.

Mica R. Endsley, PhD, is recognized as a world leader in the study and application of situation awareness in advanced systems. Dr Endsley has authored over 200 scientific articles and reports on situation awareness and is often cited in professional journals. Dr Endsley has a PhD in Industrial and Systems Engineering from the University of Southern California. As founder and president of SA Technologies, Dr Endsley leads a team of researchers, designers and engineers in situation awareness research, advanced system design, and professional writing and seminars.

Rhona Flin (Bsc, PhD Psychology) is Professor of Applied Psychology in the School of Psychology at the University of Aberdeen, UK. She directs a team of psychologists working with high risk industries and health care on research and

consultancy projects concerned with the management of safety. The group focuses on topics such as human error, decision-making, situation awareness, teamwork, leadership, safety climate and risk perception.

Ute Fischer is a research scientist in the School of Literature, Communication and Culture at the Georgia Institute of Technology. After receiving her PhD in Cognitive Psychology from Princeton University, she was a post-doctoral fellow and then a senior research scientist at the NASA Ames Research Center. Her current projects concern the effects of team composition and team training approaches on the interaction and decision strategies of small teams, such as flight crews and mission specialists.

Leila Johannesen, PhD, is a user experience engineer with IBM, focusing on database information management tools. Her areas of speciality are: usable graphical user interfaces, usability testing, accessibility for persons with disabilities, autonomic systems, and human error. She received her PhD from Ohio State University's Cognitive Systems Engineering program in 1994.

Madelyn Kahana, MD is the Associate Chair of Pediatrics for Education and the Program Director for the Pediatric Residency Program at The University of Chicago Medical Center. She is Section Chief of Pediatric Critical Care and a Professor of Anesthesia and Pediatrics. She is board certified in pediatrics, anesthesiology and critical care medicine. Dr. Kahana has specific interest and expertise in the perioperative care of the child with congenital heart disease and pediatric sedation and pain management. She has a national reputation for excellence in clinical care and teaching and regularly attends in the pediatric intensive care unit and on the pediatric sedation service.

P. Allan Klock, MD, is a board certified anesthesiologist, and an Associate Professor and Vice Chair for Clinical Affairs in the Department of Anesthesia and Critical Care at the University of Chicago. He has an undergraduate degree in Biomedical Engineering and specializes in anesthesia for urologic surgery and difficult airway management. His research interests include difficult airway management, patient outcomes and administrative and economic issues.

Julie Kowalsky, MD recently completed studies for her medical degree at The University of Chicago and is scheduled to begin her residency in radiation oncology. While in the Summer Research Program in 2004, Dr. Kowalsky performed research on the technical work of critical care medicine with particular attention to the analysis of between shift hand-offs.

David M. Musson, MD, PhD, is a physician and social psychologist whose work focuses on the human performance under stress and in safety critical settings. He completed his MD at the University of Western Ontario in 1988, and a rotating internship at the University of Toronto in 1990. He served as a flight surgeon in the Canadian Forces for five years where he was involved in flight safety and fighter aircrew support. He received a PhD in Social and Personality Psychology in 2003 at the University of Texas at Austin under the supervision of Robert Helmreich. Dr

Musson is currently the Academic Director of the Centre for Clinical Simulation at McMaster University, and an Associate Professor in the Department of Anesthesia. His recent research has examined the role of personality testing in astronaut selection, the nature of professional cultures, and the translation of error reduction strategies, such as Crew Resource Management, from aviation to medicine.

Christopher P. Nemeth, PhD, studies human performance in complex high hazard environments as a Research Associate (Assistant Professor) at the Cognitive Technologies Laboratory at the University of Chicago. Recent research interests include technical work in complex high stakes settings, research methods in individual and distributed cognition, and understanding how information technology erodes or enhances system resilience. His design and human factors consulting practice and his corporate career have encompassed a variety of application areas from healthcare to transportation and manufacturing. His consulting practice has included human factors analysis, expert witness, and product development services. His academic career has included adjunct positions with Northwestern University's McCormick College of Engineering and Applied Sciences (Associate Professor), and Illinois Institute of Technology. He retired from the Navy in 2001 at the rank of Captain after a 30-year active duty and reserve career. His book on human factors research methods, *Human Factors Methods for Design*, is now available from Taylor and Francis/CRC Press. Home page: <http://www.ctlab.org/Nemeth.cfm>.

Mark Nunnally, MD is a physician, educator and researcher at the University of Chicago. As a clinician, Dr. Nunnally performs surgical procedure anesthesia in the operating room. He also performs critical care medicine as an attending intensivist in the Surgical, Cardiothoracic and Burn Intensive Care Units (ICUs). Dr. Nunnally's research interests concern the role of technology in patient safety. His work explores a technology fallacy: that technology, instead of consistently improving patient safety, often contributes to failure in novel, unexpected ways. His work to date has focused on infusion devices, delivery systems and incident reporting.

Anne-Sophie Nyssen is Doctor of Work Psychology and Professor of Cognitive Ergonomics at the University of Liege, Belgium. Her main interest is in the study of human error in cognitive complex systems. Her PhD research on Human Error in Anaesthesia identified the role of contextual, cognitive, and organizational variables on performance. Progressively, the research extended in scope to assess the impact of technology changes on cognition. For the last ten years, she has contributed to the development and use of simulations for training and research on medical expertise. In 1999, she received a grant from NATO to do post-PhD research at Stanford University with Professor David Gaba. In the same year, her research project to develop a system-wide health care critical incident reporting system in Belgium was approved for funding by the Office of the Prime Minister of Belgium. Central to her lab is the use of multiple techniques to collect data in order to understand the complexity of work systems: *in situ* observation, questionnaire, interview, observation of performance in simulated situations and spartan lab settings.

Michael F. O'Connor, MD is a physician, educator and researcher at the University of Chicago. His clinical work is a combination of critical care medicine (where he

attends in the Medical, Surgical, Cardiothoracic and Burn ICUs), and operating room anesthesia, where his activity has been centered on anesthesia for liver transplantation. His educational activity is centered around his clinical activity. Dr. O'Connor is also Director of the Senior Medical Student Selective 'Vignettes in Physiology'. His clinical research has included new drug development (atracurium, sevoflurane, propofol, etomidate, methylnaltrexone, antithrombin, activated recombinant protein C, linezolid, and several blood substitutes), clinical research in critical care (bedside assessment of autoPEEP, use of propofol as a sedative, management of sedation in critically ill patients), and now patient safety. He has lectured about the social science of accidents in a variety of settings.

Judith Orasanu, PhD, is a Principal Investigator at the NASA Ames Research Center where she studies team communication, distributed team decision making, and crew performance in aviation and space environments. Her research on shared mental models, decision strategies, risk assessment, and error detection and correction has been adopted in the aviation, medical, nuclear power, military, offshore oil and other high-risk industries. Dr Orasanu's current research is concerned with developing tools and technologies to support space flight crews for NASA exploration missions to the Moon. Her contribution to the nascent field of naturalistic decision making resulted in the first book in the field, *Decision Making in Action: Models and Methods* (edited by G. Klein, J. Orasanu, R. Calderwood, and C. Zsambok, Ablex Publishers, 1993).

Emily S. Patterson, PhD, conducts human factors research to improve joint cognitive system performance in complex, socio-technical settings, including healthcare, military, intelligence analysis, space shuttle mission control, emergency response, and emergency call centers. She is a Research Scientist at the VA Getting at Patient Safety (GAPS) Center and the Institute for Ergonomics at the Ohio State University. Her current lines of research include medical informatics to improve patient safety, handover communications to transfer authority, making systems resilient to human error, and rigor in information analysis. She has published extensively in diverse academic outlets, including 26 journal articles and eight book chapters. She serves as a Centers Communication Advisory Group Member for the Joint Commission International Center for Patient Safety, Advisory Board Member for ECRI's Health Technology Forecast, and Editorial Board Member for *Human Factors*.

Tom Reader, MA, PhD Psychology, is a research psychologist within the Industrial Psychology Research Centre at the University of Aberdeen. His primary research interests include patient safety, teamwork and situation awareness in intensive care and other acute medical environments. Further research interests include safety climate, risk perception, and worker health and well-being in sectors such as oil and gas, aviation, and air traffic control. Prior to his academic career, Tom worked in the UK offshore oil and gas industry. Home page: <http://www.abdn.ac.uk/~psy409/dept/>

Philip J. Smith is affiliated with the Cognitive Systems Engineering Laboratory at the Ohio State University. He is a Professor in the Industrial and Systems Engineering program, with extensive experience in the design of distributed work systems and

decision support tools, including the design of the Post-Operations Evaluation Tool, an analysis system used by the FAA and the airlines to evaluate performance in the US airspace system.

Amy L. Spencer is affiliated with the Cognitive Systems Engineering Laboratory at the Ohio State University. She is a doctoral student in the Industrial and Systems Engineering program, and also has considerable previous work experience in the design of cognitive tools to support collaborative decision making in the airspace system.

Jennifer Watts-Perotti, Ph.D., is a Cognitive Engineer in the Work Practices team, in the Xerox Innovation Group. She has conducted ethnographic studies at Microsoft, Apple, NASA, Kodak, and Xerox. She is currently studying human interaction with production printing systems. Prior to her current position, she worked as an interface designer, ethnographer, and user experience researcher at Kodak. She received her Masters and Ph.D. from Ohio State University, where the research presented in her chapter was conducted.

Robert L. Wears, MD, MS is an emergency physician and holds an advanced degree in computer science. He is currently Professor in the Department of Emergency Medicine at the University of Florida, and Visiting Professor with the Clinical Safety Research Unit at Imperial. Dr Wears has been an active writer and researcher with interests in technical work studies, joint cognitive systems, and particularly the impact of information technology on safety and resilient performance. His work has been funded by the Agency for Healthcare Research and Quality, the National Patient Safety Foundation, the Emergency Medicine Foundation, the Society for Academic Emergency Medicine, the Army Research Laboratory, and the Florida Agency for Health Care Administration. Dr. Wears performs regular shifts as an active member of the emergency department clinical staff at his medical center.

David D. Woods, PhD, is affiliated with the Cognitive Systems Engineering Laboratory at the Ohio State University. He is a Professor in the Industrial and Systems Engineering program, with extensive experience with research in resilience engineering, first in nuclear power (Nuclear Regulatory Commission), later in aviation (Federal Aviation Administration), in healthcare (as Associate Director of the first VA Midwest Patient Safety Center of Inquiry from 1999-2003) and most recently at NASA as part of the Columbia Investigation Accident Board (CAIB).

Melanie C. Wright, PhD, is an Assistant Professor in the Department of Anesthesiology at the Duke University Medical Center. She completed her PhD in Industrial Engineering at North Carolina State University. She has 15 years' experience in engineering and research in the areas of human performance, usability analysis, and human-machine system design. Dr Wright is currently active in research related to information management in the peri-operative environment, and the training and assessment of team coordination skills in dynamic environments.

Foreword

Significant questions about healthcare safety demand substantive answers. What needs to be changed in order to improve healthcare work efficiency, reliability, and safety? What changes will actually make a difference? Without an adequate basis in research, notions about how to improve healthcare safety amount to only a collective guess.

Current ideas about how to improve healthcare safety have the nature of folk remedies that are passed along without understanding whether or how they actually work. Many are imported from other sectors such as manufacturing with no proof that they actually create an improvement or, if they do, whether they are suited to healthcare. This is not new. Observers within healthcare have noted this lack of insight for decades (see Cook, Woods and McDonald 1989). Clinicians' conventional views on what is admissible as scientific activity have prevented them from understanding this (Auerbach, Landefeld and Shojania 2007) and from relying on other professionals from outside healthcare. As a result, healthcare has few skills or resources to genuinely study safety at the systems level when compared with other high hazard sectors such as nuclear power generation, the military, and aviation. This shortfall makes it difficult to know what does and does not matter in the clinical setting, much less what to do about it.

While interventions suggest progress, interventions with no basis in science do more damage than good. They make systems more brittle (Sarter, Woods and Billings 1997): unable to change in response to circumstances. They induce unforeseen outcomes, waste time and resources that could be spent more productively, and delay progress toward genuine improvement. Efforts to improve healthcare safety must start with understanding it as a system (Woods and Cook 2002). This begins with understanding its *technical work*, which is the planning and management that is intimately bound up with medical care (Cook, Woods and Miller 1998). Surveys and statistical analyses have attempted to describe what occurs at the sharp (operator) end of healthcare, but these are one or more steps removed from what actually happens in the real world. Rather than illuminate the complexity of clinical work, they obscure it by averaging out complex internal details (Cilliers 1998). By contrast, the authors in this book have immersed themselves in healthcare's messy, confusing, and challenging details in order to discover how clinicians develop their own strategies to confront and surmount daily challenges (Nemeth, Cook and Woods 2004). Insights from such studies reveal how gaps can occur in care continuity (Cook, Render and Woods 2002), how systems change to fit demand, and how people anticipate and respond with gap-filling adaptations to delay or prepare for upcoming events (Woods and Hollnagel 2006). Knowing the actual nature of real work leads to the creation of more resilient systems that are able to anticipate and respond to inevitable change (Hollnagel, Woods and Leveson 2006).

These chapters are the start of a core of knowledge about the healthcare technical work that is based in well-considered, scientific, methodical research. Using this approach makes it evident how work is actually done. This is altogether different from the way that work is imagined by those who do not understand it. The difference matters, because notions about how to improve the work of healthcare and get traction in the real world must start with the deep understanding that this text describes.

David Woods
Institute for Ergonomics
The Ohio State University

References

Auerbach, A.D., Landefeld, C.S. and Shojania, K.G. (2007), 'The Tension between Needing to Improve Care and Knowing How to Do It', *New England Journal of Medicine* 357:6, 608–13.

Cilliers, P. (1998), *Complexity and Postmodernism: Understanding Complex Systems* (London, UK: Routledge).

Cook, R., Render, M. and Woods, D. (2000), 'Gaps in the Continuity of Care and Progress on Patient Safety', *British Medical Journal* 320, 791–4.

Cook, R., Woods, D. and McDonald, J.S. (1989), 'On Attributing Critical Incidents to Factors in the Environment', *Anesthesiology* 71:5, 808.

Cook, R., Woods, D. and Miller, C. (1998), *A Tale of Two Stories: Contrasting Views of Patient Safety* (Chicago: National Health Care Safety Council of the National Patient Safety Foundation, American Medical Association). <http://www.npsf.org>, accessed June 8, 2002.

Hollnagel, E., Woods, D. and Leveson, N. (2006), *Resilience Engineering: Concepts and Precepts* (Aldershot, UK: Ashgate Publishing).

Nemeth, C., Cook, R. and Woods, D. (2004), 'The Messy Details: Insights from Technical Work in Healthcare', in C. Nemeth, R. Cook and D. Woods (eds), Special Issue on Studies in Healthcare Technical Work, *IEEE Transactions on Systems, Man and Cybernetics-Part A* 34:6, 689–92.

Sarter, N., Woods, D. and Billings, C. (1997), 'Automation Surprises', in G. Salvendy (ed.), *Handbook of Human Factors and Ergonomics* (New York: John Wiley and Son) 1926–43.

Woods, D. and Cook, R.I. (2002), 'Nine Steps to Move Forward from Error', *Cognition, Technology and Work* 4:2, 137–44.

Woods, D. and Hollnagel, E. (2006), *Joint Cognitive Systems: Patterns in Cognitive Systems Engineering* (Boca Raton, FL: Taylor and Francis; CRC Press).

Preface

Among 24 gaps in patient safety research, Cooper (2000: 5, 69) identified four that bear directly on human factors, and "research about communication and information sharing among healthcare providers" was ranked third. This book strives to fill that gap.

As a service sector, healthcare relies heavily on the availability, quality, accuracy, and timing of information. Sharing problem detection and problem solving among members of a team broadens expertise and the range of attention, it avoids fixation, and it makes it easier to work in parallel and reorganize (Klein 2006). Communication is the vehicle for the information that is crucial to effective teamwork, as tasks and roles are broken into manageable parts, performed, and reassembled into a whole. The chapters in this book show how research reveals the ways in which clinicians capture, modify, use, and share information that changes continuously in response to the large and small challenges and opportunities of daily work.

This text deals primarily with communication among clinicians as a verbal experience at the task level. Certainly, there are other approaches to communication that can shed light on the topic such as theoretical models, social network theory, non-verbal communication, social psychology, and large scale coordination of cognitive work. Also, recent work (Xiao et al. 2001; Wears et al. 2003; Nemeth et al. 2006) has described how clinicians develop and use cognitive artifacts to maintain a distributed cognition. Inter-personal communication among clinicians and with patients is often cited as a problem that healthcare organizations need to improve (Meryn 1998). In fact, some consider clinician–patient communication to be the main ingredient in medical care. Because that topic has been well covered elsewhere (Ong et al. 1995), the goal of this book is to explore communications between and among health professionals, which is substantial enough to fill an entire volume.

This text takes a pragmatic approach in order to "cut to the chase" by addressing real issues that clinicians need to grasp and apply directly to their work. I invite your interest in, and comments on, the chapters that follow.

Christopher P. Nemeth
Cognitive Technologies Laboratory
The University of Chicago

References

Cooper, J.B. (2000), *Current Research in Patient Safety in the US* (Chicago: National Patient Safety Foundation).

Klein, G. (2006), 'The Strengths and Limitations of Teams for Detecting Problems', *Cognition, Technology and Work* 8:4, 227–36.

Meryn, S. (1998), 'Improving Doctor Patient Communication: Not an Option, But a Necessity', *British Medical Journal* 316:7149, 1922–30.

Nemeth, C., O'Connor, M., Klock, P.A. and Cook, R.I. (2006), 'Discovering Healthcare Cognition: The Use of Cognitive Artifacts to Reveal Cognitive Work', in Special Issue on Naturalistic Decision Making, R. Lipshitz (ed.), *Organization Studies* 27:7, 1011–35.

Ong, L.M., deHaes, J.C., Hoos, A.M. and Lammes, F.B. (1995), 'Doctor-Patient Communication: A Review of the Literature', *Social Science and Medicine* 40:7, 903–18.

Wears, R.L., Perry, S.J., Shapiro, M., Beach, C., Croskerry, P. and Behara, R. (2003), 'A Comparison of Manual and Electronic Status Boards in the Emergency Department: What's Gained and What's Lost?', *Proceedings of the Human Factors and Ergonomics Society 47th Annual Meeting* (Santa Monica, CA: HFES).

Xiao, Y., Lasome, C., Moss, J., Mackenzie, C.F. and Faraj, S. (2001), 'Cognitive Properties of a Whiteboard: A Case Study in a Trauma Centre', *Proceedings of the Seventh European Conference on Computer-Supported Cooperative Work* (Norwell, MA: Kluwer Academic Publishers) 259–78.

Acknowledgements

The editor thanks Robert Wears, MD, for his gracious service and insightful comments as reviewer for each chapter in this text.

Thanks to David Woods and Ashgate Publishing editor Guy Loft for the opportunity to edit this volume. Thanks also to Michael F. O'Connor who offered insightful comments on drafts of Chapter 1.

The authors who have contributed to this text have been generous with their time and thoughts. Those who are the subjects of study, from many walks of life and kinds of work, have made this publication possible. I offer my thanks and appreciation to all.

Dr Nemeth's research is funded by support from the Agency for Healthcare Research and Quality, and the US Food and Drug Administration.

This page intentionally left blank

Chapter 1

The Context for Improving Healthcare Team Communication

Christopher P. Nemeth

It is not unusual to find communication failure cited as a "root cause" of healthcare accidents. Single factor solutions, such as standards for how to conduct hand-offs, are recommended in reaction to such conclusions. James Reason's (1997) description of the factors that contribute to adverse events makes it clear that changing a single factor such as communication cannot overcome the multiple threats to safety in complex systems. This text, then, is not about whether improvement to communications between and among clinicians and patients can solve issues related to healthcare safety. It is: "How can healthcare information be shared better?" and "What can we expect from its improvement, and how do we get there?"

Erik Hollnagel (2004) suggests in Figure 1.1 how understanding adverse events and their causes evolves through time as we develop and use established ways of thinking about how an accident happens. Among technology and equipment, organizations, and human performance, attributions to the latter have peaked over the past 40 years. By implication, attributions to the organization are on the upswing. Among sequential, epidemiologic, and systemic accident models, the systemic model suggests that adverse as well as positive results emerge from daily operations. The research in this text largely follows the systemic model to account for the interactions of clinicians with technology and equipment as well as organizations. The traits of healthcare systems mold the properties, needs, and strategies that require team communication.

Like its high hazard sector counterparts such as aviation, nuclear power generation, ground transportation, and the military, healthcare is typically risky, complex, uncertain, and time-pressured. Staff resources are constrained in a number of ways including availability, qualifications, shift, and rank. Decisions can, and do, have severe consequences. However, healthcare has additional characteristics that make it unique from other high hazard sectors. Guidelines for clinical practice are not consistent and in some instances actually conflict with each other. Demands for care are uncertain, vary widely, and are in a continual state of change. Work is performed on compromised systems (patients) whose affliction and response to treatment is not predictable, can be difficult to assess, and may vary widely. Patients may, or may not, comply with therapeutic regimens. Patient condition, diagnoses, and the procedures to treat them are highly context-specific and individualized. In order to meet these characteristics of the demand for care, equipment and supplies are configured ad hoc—assembled and adapted to fit the individual patient and

specific procedure. Decisions on the acquisition of highly sophisticated clinical equipment are routinely made by staff members who have no clinical experience and are advised by clinicians who have no experience in the technical evaluation of complex products or systems.

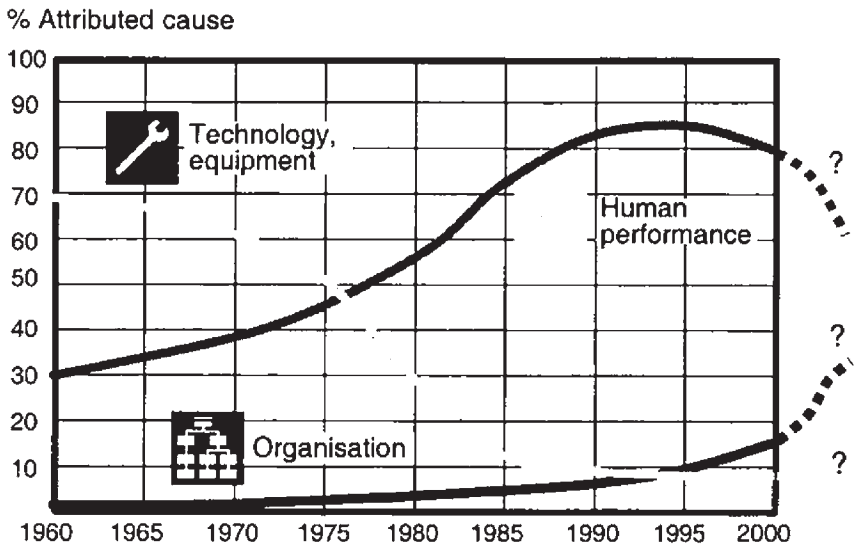


Figure 1.1 Trends in causes attributed to "accidents"
Source: Hollnagel 2004: 46.

Medical care for patients requires substantial cognitive work. *Technical work* (Cook, Woods and Miller 1998), which is the many practical and essential activities that are needed to perform medical care, also requires cognitive work. This is because what is needed for an individual patient depends on the timely synchronization of people, equipment, tools, and facilities. The planning and management of procedures for an entire suite of operating rooms (ORs) or an intensive care unit (ICU) require a similar kind of coordination. Both the individual level and the collective unit level require the performance of cognitive tasks that include the assessment of resource availability, resource allocation, the anticipation and prediction of future events, speculation about the best courses of action, negotiation to develop consensus, and trade-off decisions.

Characteristics of work in an organization can be compared to a wedge that has both sharp and blunt ends. At the sharp end, practitioners perform work applying expertise and actions using the resources at hand to generate results. Care providers work in various kinds of groups than can be ill-defined, fluid, and may overlap. They must negotiate multiple constraints in their work domains as they perform complex activities that routinely have significant consequences. The blunt (management) end develops policies, procedures, resources, and constraints that support and shape work

at the sharp end (Cook, Woods and Miller 1998: 13, 36). While blunt end cognitive work is more evident, cognition is more difficult to discern the closer one gets to the sharp end. This is because sharp end knowledge is dense, complex, changes rapidly, and is embedded in a complex social setting that resists exposure to those who are considered to be "outsiders." Clinicians deliberately set the thresholds for access to this setting higher in order to thwart scrutiny and each facility imposes additional controls to protect patient privacy.

Why This Text Matters

One of the reasons behind the popularity of "fixing" healthcare communications is that it is an available target. After all, facilities are costly to build and take a long time. Equipment is complex and requires specialized knowledge to develop and manufacture. Arduous certification procedures take time, money, and effort. People, though, are available and adaptable. The presumption is that if clinicians can be made to behave differently, the difficulties that are brought on by all manner of contributing factors might be eliminated or at least reduced. This view flows from the notion of iatrogenic medical malpractice, which is based on a traditional model that emphasizes individual practitioner agency and accountability. It also stems from hindsight bias (Agans and Shaffer 1994), which leads those who know what happened after the fact to consistently overestimate what others who lacked that knowledge could have known. In reality, practitioners act in concert, collectively coping with system defects that were "created by poor design, incorrect installation, faulty maintenance and bad management decisions" (Reason 1990: 173). Multiple causes of an adverse outcome are usually present in a system as a characteristic of its routine operation. It is poor system design, poor job design, and failed systems that "contribute significantly to harmful error by providing the conditions under which error will thrive" (Sharpe and Faden 1998: 61–77, 138, 234). If failure occurs, it is a "consequence and not a cause" because failures are "shaped and provoked by upstream, workplace and organizational factors" (Reason 1997: 126) such as limited or declining resources.

Healthcare communication must necessarily be as complex as the domain that it is intended to control (Ashby 1956; Conant and Ashby 1970). Contributions by Jens Rasmussen, James Reason, Erik Hollnagel, David Woods, Richard Cook, Yan Xiao and others have demonstrated how healthcare is a variable high stakes sector that is molded by a complex array of factors. "Team" encompasses more than a few individuals, from shifts, clinics, and departments, to clinicians, managers, technicians, suppliers, patients, consultants, and other transferring or receiving care organizations. Healthcare teams can also be fluid, shifting, can overlap, and include strangers as well as colleagues. "Communication" encompasses verbal exchange, but also includes other means to transfer information that include physical artifacts (for example, lists, status boards, schedules, orders, records, and notes), electronic systems (for example, databases, software programs, equipment displays, and controls), as well as phones, pagers, and personal digital assistants.

Views of the way that work is performed also shape notions of the tools that are intended to support it. Recent research into cognition at large scale (Nemeth 2007) in healthcare demonstrates the scope and level of effort that is necessary to understand it. Such studies rely on cognitive systems engineering (CSE) methods (Hollnagel and Woods 1983; 2005) to elicit information about work domains and to derive criteria for the development of information and communications technology (ICT) tools that are intended to aid such work. The insights that the chapters in this text contain can be used to guide the development of ICT that is intended to support healthcare cognitive work. Without the scientific analysis of such complex work, healthcare ICT systems will certainly remain clumsy (Weiner 1985), brittle (Sarter, Woods and Billings 1997), and fail to be a useful team player (Christoffersen and Woods 2002).

Team communications as it is performed in aviation is often proposed as a model for healthcare to adopt. That assumption's pristine simplicity belies the reality of healthcare's messy details (Nemeth, Cook and Woods 2004). A number of authors including Helmreich (2000), Helmreich, Musson and Sexton (2001), and Powell, Haskins and Sanders (2005) have encouraged the healthcare community to emulate the models of communications that have been developed in aviation research. Research in aviation team communication cannot be imported in its entirety to healthcare. As the introduction to this chapter explained, the domains are too different for such a simple solution to succeed. Instead, aviation should be understood in terms of what lessons will benefit healthcare communications. Rather than an ending point, research into communication in aviation provides a starting point. This text draws the connection between the lessons that have been learned through cognitive research in aviation and aerospace to cognitive research that is underway in healthcare.

How This Text is Organized

Five sections address improvement to healthcare team communications. Guest author Eric Eisenberg applies his considerable experience in team communications to describe issues that apply across high hazard sectors and to healthcare in particular. This is a valuable contemporary view of organizational communication, with a vocabulary and a framework that we can use to address the very real challenges that face healthcare systems.

Part 1 surveys the origins of research in aviation team communications as a starting point to improve communications in healthcare. Few authors have published on aviation safety as extensively as Judith Orasanu and Ute Fischer. They account for key findings in the aviation literature on aircrew effectiveness, efficiency, breakdown, interrelationships, and error mitigation, then point to lessons from that foundation which can be applied to healthcare. David Musson dispels widely held myths about crew resource management (CRM), which is one of the most popular aspects of aviation communication. Rather than leap into CRM programs, Musson cautions clinicians to better understand the presumed benefits of CRM before adopting them for use.

Part 2 covers recent work in aviation and aerospace that are less well known than flightdeck group studies and CRM, yet provide compelling lessons for healthcare. Asynchrony (conveying healthcare information across time and locations) is growing as the number of participants, and pace and complexity of the care process grows. The potential for gaps in care continuity (Cook, Render and Woods 2000) grows along with it. Two of the chapters in this section share valuable insights into effective ways to deal with asynchrony. Charles Billings, Philip Smith, and Amy Spencer leverage Dr Billings' seminal work on the Aviation Safety Reporting System to explain the implications for reporting adverse events in healthcare. Emily Patterson describes the National Aeronautic and Space Administration (NASA) use of voice loops that enables staff members to communicate asynchronously and efficiently. Melanie Wright and Mica Endsley explain the close link between healthcare communication and situation awareness—the understanding of dynamic information that is critical for task performance.

In Part 3, recent research in acute healthcare provides a well-grounded understanding of cognitive work and communication among teams. Tom Reader, Rhona Flin, and Brian Cuthbertson describe how variations in care provider perceptions influence ICU team communication. Nemeth et al. describe how clinicians create their own highly plastic forms of hand-offs between shifts in a pediatric ICU as a way to minimize gaps in the continuity of care. Jeff Brown reveals how clinicians collaboratively cross-check each other by detecting, verbalizing, and correcting work in order to sustain safety. Leila Johannesen employs an analytic approach to show how teams maintain a common ground of understanding during complex and extended surgical procedures in the OR.

Part 4 looks to the future of team communications in healthcare, taking particular note of the role that technology will play in both public and professional settings. Anne-Sophie Nyssen and Adélaïde Blavier examine how the addition of a major player – a robotic surgery unit – affects team communication in the OR. Rod Elford shares his insights into telehealth, noting how the ways that remote populations currently rely on Internet resources for healthcare information suggest future aspects of communication among patients and clinicians. Finally, Nemeth and Robert Wears offer thoughts on the future of healthcare team communication and what it will take for further research in this arena to get traction in the real world of clinical practice.

Conclusion

The chapters amply draw the connection from one high hazard sector to another, demonstrating that lessons from aviation and aerospace do inform team communication in healthcare. Their value lies not in the wholesale adoption of procedures, though, but rather in the insights that come from intense study of complex sharp end activities. More than anything, aviation and aerospace research points out *how to learn* about team communication. The text's value is not to provide definitive conclusions, but rather to signal a research approach and agenda that will make it possible to better understand and improve team communications in healthcare.