CONFLICTS BETWEEN LEARNING AND ACCOUNTABILITY IN PATIENT SAFETY

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DePaul Law Review, in press.

INTRODUCTION: CHANGING BELIEFS ABOUT ACCOUNTABILITY AND SAFETY

Currently the mechanisms of, and beliefs about, accountability are in a phase of transition in our society, particularly for health care.[1] For example, when patients are injured as a result of care, a part of the response calls for imposing new accountability relationships between health care professionals/care delivery organizations and the public they serve. Ultimately, one can see the whole patient safety movement as an expression of the public's concern about how economic pressures erode past accountability and trust relationships. The public desires new accountability mechanisms to ensure that the patient will be preeminent relative to the other goals of health care organizations and personnel.[2]

Accountability is emphasized in the debate on patient safety because how decision makers are held accountable is presumed to influence how they make decisions and the quality of those decisions. Social links such as accountability are indeed powerful forces influencing human decision–making, and these relationships have been studied in organizational dynamics, social cognition, and human-machine interaction.[3]

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[1] Sharpe, V. A. and Faden, A. I. (1998). *Medical Harm: Historical, Conceptual, and Ethical Dimensions of Iatrogenic Illness*. Cambridge University Press, New York.

[2] Richard I. Cook et al., *A Tale of Two Stories: Contrasting Views on Patient Safety*, National Patient Safety Foundation at the AMA (1998) *at* http://www.npsf.org/exec/npsf_rtp.pdf.

[3] Hirschhorn, L. (1993). Hierarchy vs. bureaucracy: The case of a nuclear reactor. In K. H. Roberts (Ed.), *New challenges to understanding organizations.* New York: McMillan. Philip E. Tetlock, *Accountability Theory: Mixing Properties of Human Agents with Properties of Social Systems, in* SHARED COGNITION IN ORGANIZATIONS: THE MANAGEMENT OF KNOWLEDGE 117-137 (Leigh L. Thompson et al. eds., Lawrence

Social and cognitive scientists have shown how human decision making always occurs in a context of expectations that one may be called to give accounts for those decisions to different parties.[4] How and to whom people expect to be called to account affects their performance in implicit and explicit ways. The expectations for what are considered adequate accounts and the consequences for people when their accounts are judged inadequate are critical parts of a *cycle* of giving accounts and being called to account. This is a *reciprocating* cycle because how one may be called to account influences behavior and how one calls others to account is influenced by beliefs about the factors that influence human decisions.[5] Interestingly, different factors in this reciprocating cycle can support or undermine practitioner performance and learning in predictable ways.

Thus, the patient safety movement can be seen as an ongoing case of change in this reciprocating cycle. The calls for new accountability relationships that emerge following celebrated cases of patient injuries represent beliefs by different stakeholders in health care about how different forms of calling to account will effect behavior and performance.[6] However, different assumptions regarding how cycles of accountability work lead to very different and conflicting plans about how to change health care systems to improve patient safety.

This paper contrasts those common beliefs about accountability with research based on how different mechanisms of being called to account affect those aspects of decision–making most relevant to improving patient safety. First, past research shows that there is a complex set of factors, relationships, and effects at work in the reciprocating cycle of calling on, and giving of, accounts. Second, the empirical regularities and relationships are not consistent with motivational accounts, i.e., that accountability creates general improvements by increasing task motivation. Third, and most startling, the research demonstrates that some factors in the reciprocating cycles of

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Erlbaum Assoc., 1999) Adamski, A. J. and Westrum, R. (2003). Requisite Imagination: The Fine Art of Anticipating What Might Go Wrong. In E. Hollnagel (ed.), *Handbook of Cognitive Task Design*. Erlbaum, 2003.

[4] Lerner, J. S., & Tetlock, P. E. (1999). Accounting for the effects of accountability. *Psychological Bulletin, 125*(2), 255-275.

[5] Lerner & Tetlock, *supra* note 4.

accountability may degrade decisions, performance, cooperation, and learning, while other relationships in the cycle may enhance these cognitive processes. For example, under some conditions the need to give an account for a decision to others can increase critical thinking and attenuate commitment (presumably ways to enhance the decision), while other conditions can increase self–justification, and bolster an initial attitude and commitment (presumably ways that reduce the quality of a decision). Some forms of accountability can increase defensive behavior, create adversarial relationships among parties who need to cooperate, or lead people to prefer options that are easier to justify given knowledge of the standards others impose for giving suitable accounts.

Thus, a systems approach to patient safety also examines the reciprocating cycle of giving accounts and calling to accounts to determine the lawful effects of different accountability relationships. The slogan of "moving beyond a culture of blame" in the patient safety movement is a call to abandon poor systems of accountability and to begin to design a more effective reciprocating cycle, not a tolerance for an absence of accountability.[7] This paper presents a set of conflicts between the typical beliefs about the effects of systems of accountability and the research results that relate to building high resilience/high reliability organizations, including several ways that poor systems of accountability can degrade cognitive and cooperative work and human-computer cooperation.

CONFLICTS BETWEEN ACCOUNTABILITY-AS-BLAME AND LEARNING

The patient safety movement has been based on three ideas derived from results of research on human expertise, collaborative work, and high reliability organizations built up through investments by other industries:[8]

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[6] Cook et al., *supra* note 3.
[7] Dekker, S. W. A. (2004). Ten Questions about Human Error: A new view of human factors and system safety. Lawrence Erlbaum, Hillsdale NJ, in press.
[8] For syntheses see the work of Jens Rasmussen such as Rasmussen J. (1990a). The role of error in organizing behavior. *Ergonomics*. 33: 1185-1199; Rasmussen, J. (1990b) Human Error and the Problem of Causality in Analysis of Accidents. *Phil. Trans. R. Soc. Lond.* B 327, 449-462; or Rasmussen J. (1999). The concept of human error: Is it useful for the design of safe systems in health care? In Vincent C, deMoll B. (Eds.) *Risk and Safety in Medicine*. London: Elsevier, 1999. James Reason synthesizes the results on

- adopt a 'systems approach' to understand how breakdowns can occur and how to support decisions in the increasingly complex worlds of health care;[9]
- move beyond a culture of blame to create open flow of information and learning about vulnerabilities to failure;[10]
- build partnerships across all stakeholders in health care to set aside differences and to make progress on a common overarching goal.[11]

The lessons from research point out that blame and the accompanying threat of punishment and stigmatization activates defensive mechanisms, drives out information about systemic vulnerabilities, stops learning, and undermines the potential for improvement.[12]

As these new messages about a systems approach to safety circulated and became more visible in health care, they collided with the common belief that practitioners and managers should be "accountable" to patients and to other stakeholders.[13] For many, the systems approach seems to erode accountability relationships or to provide cover for

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organizational contributors in Reason, J. T. (1997). *Managing the risks of organizational accidents*. Aldershot, UK: Ashgate Publishing Co. The results on characteristics s of high reliability organizations are covered in Gene I. Rochlin, *Safe Operation as a Social Construct*, 42 ERGONOMICS 1549 (1999) and in Weick, K. E., Sutcliffe, K. M. and Obstfeld, D. (1999). Organizing for high reliability: Processes of collective mindfulness. *Res Organizational Behav*ior, 21:23-81.

[9] Cook et al., ., *supra* note 3; Woods, D. D., and Cook, R. I. (2002). Nine steps to move forward from error. *Cognition, Technology and Work, 4*, 137-144.

[10] Dekker, S. W. A. (2002). *The field guide to human error investigations*. Bedford, UK: Cranfield University Press/Aldershot, UK: Ashgate. Dekker, ., *supra* note7.

[11] Hendie, W. (ed.), Proceedings of *Enhancing Patient Safety and Reducing Errors in Health Care*. National Patient Safety Foundation, Chicago IL (held at Annenberg Center for Health Sciences, Rancho Mirage CA Nov. 8–10, 1998). Woods D. D. (2000). Behind Human Error: Human Factors Research to Improve Patient Safety. Testimony to the National Summit on Medical Errors and Patient Safety Research, Quality Interagency Coordination Task Force, Washington DC, September 11, 2000. Or chapter 2 of the forthcoming National Academy Of Engineering and Institute Of Medicine report on "Engineering and the Health Care System."

[12] Weick et al., *supra* note 8 and Tetlock, *supra* note 3. Charles Billings covers these issues in aviation in Billings, C. E. (1999). The NASA Aviation Safety Reporting System: Lessons Learned from Voluntary Incident Reporting. In Proceedings of *Enhancing Patient Safety and Reducing Errors in Health Care*. National Patient Safety Foundation, Chicago IL (held at Annenberg Center for Health Sciences, Rancho Mirage CA Nov. 8–10, 1998).

individuals or organizations involved in episodes where patients are injured in the process of care. Hence, the patient safety movement faces a basic conflict between learning/improving systems and holding individuals responsible for the consequences of their decisions and actions.

In the common belief, accountability systems are operationalized in terms of identification of culprits, threats of disciplinary (or even criminal) proceedings, monetary losses, and threats of stigmatization.[14] Thus, calls for increased accountability take the form of imposing new or increased consequences for practitioners and delivery organizations after a patient is injured as a result of care. These beliefs rest on assumptions that remedial and disciplinary actions will produce improvements by channeling or increasing the motivation and energy devoted to patient care. To many who may bear the brunt of failure, any argument to move beyond a culture of blame is suspected as a disguised attempt to protect culprits.[15]

At the root of these reactions is one model of how people contribute to success and to failure—the notion that erratic people degrade an otherwise safe system.[16] In this belief system, work on safety involves methods to protect the system (us as managers, regulators and consumers) from unreliable people. Blame becomes part of the process of identifying and protecting us from those other erratic people. Once culprits are identified, we can then invoke methods of remedial training, professional disciplinary action, limits on practice, banishment, or even criminal prosecution to improve safety.[17]

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[13] Sharpe & Faden, *supra*, note 1.

[14] Fischhoff, B. (1998). Diagnosing Stigma. *Reliability Engineering and System Safety*. 59, 47-48. Dekker, S. W. A. (2003). When human error becomes a crime. Journal of Human Factors and Aerospace Safety, 3(1), 83-92. Dekker 2004, supra note 7. Brown, J. P. (2005). Ethical Dilemmas in Healthcare. In M. Patankar, J. P. Brown & M. D. Treadwell (eds), Ethics in Safety. Cases From Aviation, Healthcare, And Occupational And Environmental Health. Ashgate, Burlington VT, in press.

[15] Sharpe, V. A. (2004). Accountability and Justice in Patient Safety Reform. In V. A. Sharpe (ed.), *Accountability: Patient Safety and Policy Reform*. Georgetown University Press, Washington DC, 2004.

[16] Dekker, *supra* note 10. Woods D. D. and Cook R. I.(2003). Mistaking Error. In M. J. Hatlie and B. J. Youngberg (Eds.) *Patient Safety Handbook*, Jones and Bartlett.

[17] Critiques of widespread 'folk' models of human error can be found in Dekker, S. W. A. (2004). *Ten Questions about Human Error: A new view of human factors and system*

This is an intuitive, common, and powerful way to view safety, and it is erroneous, based on research results on expert human performance, results on characteristics of high reliability organizations, and experience from other industries.[18] The alternative model derived from research is that *people create safety* at all levels of the socio-technical system by learning and adapting to information about how all participants can contribute to failure.[19] Progress comes from helping people make safety in the face of systemic vulnerabilities. Startlingly, this is what the science says—help people, at all levels of organizations and institutions, cope with complexity to achieve success.[20]

The social value of accountability, interpreted and implemented as threats of sanctions against those acts judged after-the-fact as causal, collides with these results on how to achieve extremely high reliability in several ways.

Blame Blocks Information Flow and Learning

Empirical results on organizations that manage potentially hazardous technical operations remarkably successfully are quite surprising in that success was not related to how these organizations avoided risks or reduced errors.[21] High reliability organizations created safety by anticipating and planning for unexpected events and future surprises.

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safety. Erlbaum, in press; Chapter 5 of Erik Hollnagel's *Barrier Analysis and Accident Prevention.* Taylor & Francis, in press; or Woods & Cook, *supra* note 16.

[18] See, respectively, Woods D. D., Johannesen, L., Cook, R. I., and Sarter, N. B. (1994). *Behind Human Error: Cognitive Systems, Computers and Hindsight*. Crew Systems Ergonomic Information and Analysis Center, Wright Patterson Air Force Base, Dayton OH. (order at http://iac.dtic.mil/hsiac/SOARS.htm#Past); Rochlin, G. I., La Porte, T. R. and Roberts, K. H. (1987). The self-designing high-reliability organization, Aircraft carrier flight operations at sea. *Naval War College Review*, Autumn, 76—90; and Billings, C. E. (1996). *Aviation automation: The search for a human-centered approach*. Mahwah, NJ: Erlbaum.

[19] *See* Rasmussen (1999), *supra* note 8; Rochlin, *supra* note 6; Hollnagel (in press) *supra* note 6 for the general results.

[20]; *See* Cook et al., *supra* note 3, , R. I. Cook, M. Render and D. D. Woods, *Gaps in the Continuity of Care and Progression on Patient Safety*, 320 BRIT. MED. J. 791 (2000); or E. S. Patterson, R.I. Cook and D.D. Woods. Gaps and Resilience. In M. S. Bogner (ed.) *Human Error in Medicine*, second edition. Erlbaum, in press. For a similar analysis related to surgery see J. Carthey et al., *Institutional Resilience in Healthcare Systems*, 10 QUALITY HEALTH CARE 29 (2001).

These organizations did not take past success as a reason for confidence. Instead, they continued to invest in anticipating the changing potential for failure because of the deeply held understanding that their knowledge base was fragile in the face of the hazards inherent in their work and the changes omnipresent in their environment.[22] Safety for these organizations was not a commodity, but a value that required continuing reinforcement and investment. The learning activities at the heart of this process depended on the open flow of information about the changing potential for failure. "High reliability" organizations value such information flow, use multiple methods to generate this information, and then use this information to guide adaptive and constructive changes without waiting for accidents to occur.[23]

These results mean that mechanisms are needed to help health care organizations learn about the changing potential paths to failure and about the changing effectiveness of their failure sensitive strategies *before* injuries occur. However, accountability established through blame and personal consequences for those closely associated with cases of failure creates pressure to limit or suppress communication of information regarding the potential hazards and paths to failure.

The contrast between two parallel and highly visible disasters that played out in 2003 is particularly instructive.[24] An independent and highly distinguished technical panel examined the Columbia accident and NASA as an organization.[25] The public,

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[21] Rochlin *supra* note 8; Rasmussen, 1990a, *supra* note 8.
[22] Reason 1997 *supra* note 8; Weick et al., *supra* note 8.
[23] Experience in aviation safety is widely cited to indicate the power of information about potential hazards to producing very high levels of success. Several mechanisms exist in aviation to step outside of normal mechanisms of blame to emphasize learning about systemic vulnerabilities which create the potential for failure. *See*, *e.g.*, Billings, *supra* note 12. Aerospace has also shown the importance of independent technical investigations in the learning process.
[24] Both events occurred in February of 2003 and two very different processes to understand and learn from these tragedies played out in parallel over the next few months.
[25] *See* Columbia Accident Investigation Bd., *Report Volume I* (August 2003), *available at* http://www.caib.us/news/report/pdf/vol1/full/caib_report_volume1.pdf., which analyzed and recommended changes to fundamental aspects of NASA as an organization as opposed to fixating only on the proximal events leading to the accident. *See also* W. Starbuck and M. FARJOURN (EDS.), *Organization At The Limit: NASA and the Columbia Disaster*. Blackwell, Forthcoming 2005.

independent process produced a wide ranging and detailed set of information on how to improve the organization. NASA supported the investigation and is acting on what was learned despite enduring the burden of criticism and the public dissemination of significant deficiencies as an organization. Systemic changes are widespread and the only question is will these new investments be sustained over the long term. Plus, the lessons are public and can be used by all organizations that manage risky processes under intense production pressures.

During the same time period a seventeen–year old girl died following mistakes in a transplant procedure at the Duke University Hospital.[26] As compared to the Columbia accident, little is known publicly about the deeper systemic and organizational contributors to the accident. Press releases by the hospital itself and press reports provide most of the available information (as the legal, institutional, and professional responses that followed the event are largely invisible to the public).[27] The comparison of the responses to the two tragedies raises questions for health care organizations such as: why was there no deeper independent investigation? What systemic responses are needed and how are these changes monitored over time? Can press releases about an organization's responses re-establish trust and confidence?[28]

Accountability cycles based on blame deflect energy that could be devoted instead to a search to define who is responsible. This takes the form of psychological and social processes of causal attribution by which one of several contributors will be judged the cause after-the-fact.[29] The party defined as being responsible for that part of the system operation will then be seen as a culprit to whom sanctions should be applied. Evidence of blemishes is gathered to justify that party's deficiencies. Even simple

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[26] INSIDE: The Duke University Medical Center Employee Newsletter. Lessons from Jesica. February, 24, 2003, Volume 12, No. 4., http://dukemednews.duke.edu/mediakits/detail.php?id=6498#remembered

[27] R. Snyderman & W. J. Fulkerson, Jesica Santillan Remembered. Duke University Media Kit, Feb. 4, 2004.

[28] The contrast between the two investigations is striking and provides an interesting lead in to results on how learning after accidents can break down as described in chapter 6 of *Behind Human Error*, Woods et al., 1994, *supra* note 18.

[29] Woods et al., *supra* note 18; Dekker, 2002, *supra* note 10; Dekker, 2004, *supra* note 7.

variations in normal work processes can be made to look like an ominous early warning sign of internal deficiencies in the context of a known failure.

Distributed Responsibility in Systems of Care

The increasingly interconnected nature of health care produces a dramatic shift. Today, a patient's course and outcome depends on a system of care where connections, handovers, cross checks and information exchange take place between different providers in different roles in different places and at different times. Smoothly interconnecting these different roles and activities to achieve continuity for the patient is difficult. A result of this shift, a joint result of the different parts of the care system, is that it creates the need to consider distributed or collective responsibility.[30]

As the health care community learns more about taking a systems approach to safety issues, we see people troubled and fearful that the focus on "systems" rather than individuals dilutes responsibility. For example, a chair of a nursing board expressed frustration with a systems approach: "What is 'a system'? A system is an inanimate thing and you can't blame an inanimate thing. I believe a system is created and perpetuated by people."[31]

The irony seems to be that pressure for individual accountability continues to be intense at the same time as processes of organizational and technical change distribute care more and more in a larger system of interconnected parts.[32] How do we coordinate and share responsibility in a distributed system of care?

Multiple Contributors to Failure

Research on how complex systems fail reveals: 1) that accidents have multiple contributors, each necessary but only jointly sufficient; 2) some of these factors occur prior to the accident and arise in management or what is termed the blunt end of the

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[30] *See* SHARPE & FADEN, *supra* note 1; Ezekial J. Emanuel & Linda L. Emanuel, *What is Accountability in Health Care?*, 124 ANNALS INTERNAL MED. 229 (1996); Larry I. Palmer, *Patient Safety, Risk Reduction and the Law*, 36 HOUS. L. REV. 1609 (1999); Virginia A. Sharpe, *Accountability and Responsibility in Patient Care*, J. MED. & PHIL. 28 (2000).

[31] Richard A. Knox, *Nurses Fight Back*, B.GLOBE, Jan. 21, 1999, at A1.

[32] See Dekker 2003, *supra* note 14 for an examination of the trend to criminalize error.

organization; and 3) knowledge of outcome biases assessment of the quality of the processes that contributed to that outcome.[33]

The combination of multiple contributors and hindsight bias creates another difficulty for attributions of responsibility. Since most responses to accidents are still based on a single 'cause' (or linear chain of causes) view of how accidents occur, the presence of multiple contributors allows people to debate which contributor is the dominant cause and therefore the person or group who should be held accountable.[34] As a result, we see, after-the-accident, people/groups jockeying to deflect "accountability" and consequences onto other contributing factors as the cause and onto other parties as responsible for those parts of the overall system.[35] This process resembles the children's game of musical chairs as each group jostles to avoid being labeled as "cause" when the music of post-incident review stops. For example, hindsight bias makes it easy to downplay organizational contributors and only pursue those people who stood closest to the failure event—nurses, physicians, pilots.[36]

Others will play the attribution of causality process in the other direction. By focusing on the full range of multiple factors that came together to produce the accident, one can absolve or lessen the consequences for any one party to the adverse event. This creates the impression in the public that none of the relevant parts of the organizations are being held to account. Finally, some have used the research results that point to organizational contributors to an accident to argue for punishment and stigmatization for the relevant organization as well as the individual professionals involved at the sharp end of the accident.[37] Despite these difficulties in learning after accidents, in two significant

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[33] These are described in Reason, 1997, *supra* note 8; Woods et al., *supra* note 18; and Dekker, 2002, *supra* note 10.

[34] See Woods et al., chapter 6, *supra* note 18; Dekker, 2002, *supra* note 10; Leveson, N. G., A New Accident Model for Engineering Safer Systems. *Safety Science*, 42(4), April 2004, pp. 237-270.

[35] Dekker, 2004, *supra* note 7.

[36] Woods et al., *supra* note 18; Dekker, 2002, *supra* note 10.

[37] To see these kinds of processes play out, consider the debate over the Colorado nurses case where a medication misadministration resulted in the death of a newborn as captured in the National Patient Safety Foundation, *Enhancing Patients Safety and Reducing Errors in Health Care* (1998), *available at* http://www.npsf.org/congress_archive/1998/assets/syllabus.rtf. Analyses showed many

cases, independent investigation boards have characterized NASA accidents as organizational failures, analyzed the multiple parallel contributors and recommended broad, major, sustained institutional reforms.[38]

Given that failures in complex systems are characterized by multiple parallel contributors, not single causes, how can accountability systems address how multiple contributors come together over time and over different levels of the organization and avoid a counterproductive, fractionated, and partisan debate about over which of these contributors is the "cause"?

Responsibility and Autonomous Computers in Health Care

Among the multiple parties and organizations that may contribute in the genesis of a patient injury, computers—and the organizations that design, produce, and maintain them—are becoming more central in patient care. Computers increasingly have or will have the autonomy and authority to make decisions and take actions; computer networks allow new forms of delivery and communication as in telemedicine.[39] Increasing the scope, authority, and autonomy of computers in health care changes the nature of practitioners' roles in delivery of care.[40] How people and computers work together as a team becomes a new and critical part of achieving success or failure. Breakdowns in

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contributors to the misadministration (wrong dose and wrong route of administration) including pharmacy and physicians, yet criminal proceedings were directed at the 3 nurses who were on hand during the misadministration. Following an analysis of the multiple contributors, the attorneys for the defense and prosecution defended their positions in the case as a criminal matter. Also see Dekker's 2003, supra note 14, analysis of criminal cases against pilots following accidents and Brown's analysis of safety dilemmas' in managing health care systems: Brown, J. P. (2005). Key Themes in Healthcare Safety Dilemmas. In M. Patankar, J. P. Brown & M. D. Treadwell (eds), Ethics in Safety. Cases From Aviation, Healthcare, And Occupational And Environmental Health. Ashgate, Burlington VT, in press.

[38] See ARTHUR G. STEPHENSON ET AL., REPORT ON PROJECT MANAGEMENT IN NASA, MARS CLIMATE ORBITER MISHAP INVESTIGATION BOARD (Mar. 13, 2000); and HAROLD G. GEHMAN, JR., COLUMBIA ACCIDENT INVESTIGATION BOARD REPORT: VOLUME I (Aug. 2003).

[39] See chapter 3 of the forthcoming National Academy Of Engineering and Institute Of Medicine report on "Engineering and the Health Care System."

[40] See the "uncelebrated" cases in Cook et al., *supra* note 2, and failures such as Brink, G. Patient dies in robot-aided surgery St. Petersburg Times, October 30, 2002.

coordination between people and computers are increasingly a major part of the story of accidents in other fields as well as in some areas of health care.[41] The computer's new role also changes vulnerabilities to failure as software reliability becomes an important contributor to adverse events.[42] Unanticipated behavior of software or unforeseen interactions across software modules have contributed to numerous failures in aerospace applications.[43]

When computers are integral parts of care, how are software engineering and automation design included in reciprocal cycles of accountability? To date, the dominant cycle is a kind of attribution game:[44] When the outcome is success (new levels of performance), software development organizations are quick to tout the software as the critical ingredient (single factor credit attribution). When the outcome is failure (new

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[41] For studies of human-automation coordination breakdowns in aviation see Billings, *supra* note 12, and N. Sarter, D.D. Woods and C. Billings. Automation Surprises. In G. Salvendy, editor, *Handbook of Human Factors/Ergonomics*, second edition, Wiley, New York, pp. 1926-1943, 1997. For human-automation coordination breakdowns in anesthesiology see Cook, R.I., Woods, D. D. and Howie, M.B. (1992). Unintentional delivery of vasoactive drugs with an electromechanical infusion device. *Journal of Cardiothoracic and Vascular Anesthesia*, 6:238—244 and Lin, L., Isla, R., Doniz, K., Harkness, H., Vicente, K. J. and Doyle, D. J. (1998). Applying Human Factors to the Design of Medical Equipment: Patient-Controlled Analgesia. *Journal of Clinical Monioring,*14: 253-263.

[42] See Leveson, N. G. *Safeware: System Safety and Computers*. Addison-Wesley, 1995 and Summary of a Workshop on Software Certification and Dependability. L. Millett and D. Jackson (eds.), The National Academies Press, Washington, D.C., 2004. For a broader perspective see, Rochlin, G. I. *Trapped in the net : the unanticipated consequences of computerization*. Princeton, N.J. : Princeton University Press, 1997.

[43] A330 test flight crash in 1995, Aviation Week and Space Technology. Toulouse A330 Flight Swiftly Turned Critical. 04/17/95, p. 44. U.S. Air Force Aircraft Accident Investigation Board Report, RQ 4A Global Hawk UAV, 98-2003, Edwards AFB, CA, 12-06-1999. Leveson, N. G. (2001). Systemic Factors In Software-Related Spacecraft Accidents, American Institute of Aeronautics and Astronautics, AIAA 2001-4763. Stephenson, *supra* note 36, at 12.

[44] For one list of computer designer/manager rationalizations for why the lessons from accidents do not apply to them see D.D. Woods and N. Sarter. Learning from Automation Surprises and Going Sour Accidents. In N. Sarter and R. Amalberti (Eds.), *Cognitive Engineering in the Aviation Domain*, Erlbaum, Hillsdale NJ, 2000. For a specific case of these rationalizations in health care see Doyle, J. D. and Vicente, K. J. (2001). Patient-Controlled Analgesia. *Canadian Medical Association Journal*. 164(5): 620 (and reply by C. H. McLeskey; plus the debate in APSF Newsletter, 15(3): 36-39, 2000).

accidents), software development organizations are quick to say that the system was only a backup or optional and that erratic people at the sharp end were the critical ingredient in the adverse event (blame attribution). This pattern is particularly vivid in the responses to accidents involving the breakdown of coordination between automation and people.[45]

These arguments over attributing cause to people or to automation serve as a specific example of the process of deflecting consequences following bad outcomes to those who represent other contributors to the adverse event. It illustrates how the search for "the" cause blocks understanding of how complex systems fail through the conjunction of multiple contributors, only jointly sufficient.[46] Accountability systems that emphasize sanctions for the individual or group that represent the "cause" increase the effort devoted to these processes of attribution after-the-fact. As one observer of technology commented on such after-the-event debates, "interface *n* An arbitrary line of demarcation set up in order to apportion the blame for malfunctions."[47]

How are software organizations responsible for failures when working with others in a system of accountability that is distributed across the multiple organizations determining the overall performance and resilience of health care delivery?

POOR SYSTEMS OF ACCOUNTABILITY CREATE OR EXACERBATE DOUBLE BINDS AND GOAL CONFLICTS

Multiple, simultaneously active goals are the rule, rather than the exception, for virtually all domains in which expertise is involved.[48] Practitioners must cope with the presence of multiple goals, shifting between them, weighing them, choosing to pursue some rather than others, abandoning one, embracing another. Many of the goals encountered in practice are implicit and unstated. Goals often conflict. Sometimes these conflicts are easily resolved in favor of one or another goal, sometimes they are not.

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45 See Woods and Sarter, 2000 for a review in aviation; Leveson, 2001 for a review in space operations; Cook et al., 1998, Lin et al., 1998; for cases involving infusion devices in health care.

46 See Woods et al., *supra* note 18, ch. 6.

47 Kelly-Bootle, S. (1995). *The Computer Contradictionary* (2nd edition). MIT Press, Cambridge MA.

48 R.I. Cook and D.D. Woods. Operating at the 'Sharp End:' The Complexity of Human Error. In M.S. Bogner, editor, *Human Error in Medicine*, Erlbaum, 1994.

Sometimes the conflicts are direct and irreducible, for example when achieving one goal necessarily precludes achieving another one. But there are also intermediate situations, where several goals may be partially satisfied simultaneously. Multiple interacting goals produce *tradeoffs* and *dilemmas*. Resolving these tradeoffs and dilemmas takes place under time pressure and in the face of uncertainty. While some dilemmas arise from demands inherent in the process to be managed and controlled, organizations also constrain and pressure practice in ways that create or intensify dilemmas. Organizational factors at the blunt end of systems shape the world in which practitioners work by influencing the tradeoffs they face and the means available to resolve dilemmas. Any adequate analysis of a field of practice requires explicit description of the interacting goals, how they contribute to tradeoffs and dilemmas in particular situations, and the ways in which practitioners handle them.

How do different systems of accountability exacerbate or help resolve goal conflicts and dilemmas? The research results are clear—when organizations' and industries' system of accountability creates authority-responsibility double binds, they impose new complexities and dilemmas that undermine practice at the sharp end.[49] Authority-responsibility double binds occur when one has responsibility and others will impose sanctions for outcomes, but that party no longer has sufficient authority to influence or control the processes that lead to outcomes.[50]

For example, in a study by Hirschhorn after the Three Mile Island accident, utility managers were encouraged by the Nuclear Regulatory Commission to develop detailed and comprehensive work procedures.[51] The management at a particular nuclear power plant instituted a policy of verbatim compliance with all written procedures. This development occurred in a regulatory climate which believes that absolute adherence to procedures is the means to achieve safe operations and avoid "human error."

However, for the people at the sharp end of the system who actually did things, strictly following the procedures posed great difficulties because: a) the procedures were inevitably incomplete and sometimes contradictory; and b) novel circumstances arose

[49] *See* Woods et al., *supra* note 18, ch. 4 and Brown, *supra* note 3.
[50] Woods et al., *supra* note 18, ch. 4.
[51] Hirschhorn, *supra* note 3.

that were not anticipated in the work procedures. As a result, sometimes success could not be obtained if one only followed the procedure.

Because accountability standards demanded strict adherence to procedures in this organization, the policy created a "double bind:" in some situations, if the operators followed the standard procedures strictly the job would not be accomplished adequately; if they always waited for formal permission to deviate from standard procedures, throughput, and productivity would be degraded substantially. If operators deviated and it later turned out that there was a problem with what they did (e.g., they did not adapt adequately), it could create re-work or safety or economic problems.[52]

The double bind arises because the workers are held responsible for the outcome (the poor job, the lost productivity, or the erroneous adaptation); yet they did not have authority for the work practices because they were expected to comply exactly with the written procedures. As Hirschhorn put it,

"They had much responsibility, indeed as licensed professionals many could be personally fined for errors, but were uncertain of their authority. What freedom of action did they have, what were they responsible for? This gap between responsibility and authority meant that operators and their supervisors felt accountable for events and actions they could neither influence nor control."[53]

In a process of adaptation to organizational pressures, practitioners respond in one of two basic ways. When one party has responsibility, in that they can experience sanctions based on outcomes, without effective authority to influence the outcome sufficiently, one response is to try to pass responsibility on to others as well. This is sometimes referred to as a learned helplessness response as people distance themselves from both responsibility and authority;[54] for example, narrowly following rules, even when they are inappropriate, is a way a worker can reject responsibility when they do not possess appropriate authority.

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[52] Authority-responsibility double binds and operator coping strategies also arise in the context of autonomous computers given the fundamental brittleness and literal mindedness of algorthims. *See* Woods et al., *supra* note 18, ch. 5.

[53] Hirschhorn, *supra* note 3, at 140. *See also* Rochlin, *supra* note 40 and Weick et al., *supra* note 8 (for observations that taking responsibility depends on having authority on the processes that influence outcomes).

Because practitioners' are committed to get the job done in the face of omnipresent organizational hurdles and other difficulties and gaps, a second response is more common —development of a covert work system. Practitioners develop one work system to get the job done given the inherent demands, tradeoffs, uncertainties and constraints imposed, while they appear to carry out another work system through formal documentation and other means to meet the standards for providing accounts to other stakeholders at the blunt end of the organization.[55]

Accountability systems can demand that practitioners give accounts based on adherence to procedures.[56] Since procedures can never be a complete, consistent and coherent account of the skills and judgments required in practice, this creates a gap between the organization's image of technical work and the actual nature of technical work at the sharp end. Authority-responsibility double binds also exacerbate this gap. High reliability, high resilience organizations work hard to close this gap, always questioning whether they understand the dilemmas and tradeoffs faced in sharp end practice.[57]

Poor Systems of Accountability Degrade Cooperation

Health care, like all complex systems, requires coordinated activity to achieve continuity of care.[58] The nature of organizational, economic, and technological change in health care all increase demands for effective collaboration to deliver care both safely and

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[54] Woods et al., *supra* note 18, ch. 4.
[55] Covert work systems also have been explored by Bourrier, Mathilde. Constructing organizational reliability: the problem of embeddedness and duality. In J. Misumi, B. Wilpert, & R. Miller (eds.), Nuclear safety : a human factors perspective. London ; Philadelphia : Taylor & Francis, 1999.
[56] Dekker 2004, *supra* note 7.
[57] Rochlin, *supra* note 8; Weick et al., *supra* note 8; Cook et al., *supra* note 20 ; Woods & Cook, *supra* note 20.
[58] See Patterson, E.S., Roth, E.M., Woods, D.D., Chow, R., Gomes, J.O. (2004). Handoff strategies in settings with high consequences for failure: Lessons for health care operations. *International Journal for Quality in Health Care, 16(2),* 125-132 for an example of how to improve coordination across health care workers, and see Patterson, E. S., Cook, R. I., Woods, D.D. and Render, M.L. (2004). Examining the Complexity Behind a Medication Error: Generic Patterns in Communication. *IEEE SMC Part A*, 34(6), 749-756 for an adverse event where coordination broke down.

efficiently. The question then becomes how do different relationships in cycles of accountability affect collaborative work and coordinated activity?

In order to carry out joint, interdependent activity, research has shown that the parties involved enter into a "Basic Compact," i.e., an agreement (often tacit) to facilitate coordination, work toward shared goals, and prevent the team's breakdown.[59] One aspect of the Basic Compact is the commitment to some degree of aligning multiple goals. Typically this entails one or more participants relaxing some shorter-term, more local goals in order to permit more global and longer-term goals to be addressed.

Studies of cooperative exchange indicate that the basic compact is a form of positive reciprocity because overall results on critical goals like patient safety or continuity of patient care dependent on the joint impact of the actions and decisions of multiple parties over time. As one researcher described the complex reciprocal dependency, "Person 1 shows "trust" for person 2 by taking an action that gives up some amount of immediate benefit in return for a longer run benefit for both, but in doing so person 1 relies on person 2 to "reciprocate " in the future by taking an action that gives up some benefit in order to make both persons better off than they were at the starting point."[60]

Accountability systems based on sanctions can increase defensiveness and reduce commitment to this Basic Compact that underlies coordinated activity.[61] If one party can experience high negative sanctions depending on outcome, they are less likely to relax

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[59] For overviews of how cognitive activity is coordinated and the role of common ground see Herbert H. Clark & Susan E. Brennan, *Grounding in Communication, in* PERSPECTIVES ON SOCIALLY SHARED COGNITION 127 (Lauren B. Resnick et al. eds., 1991), and Klein, G., Feltovich, P. J., Bradshaw, J.M., & Woods, D.D. (in press). Common ground and coordination in joint activity. In W.R. Rouse & K.B. Boff (Eds.), *Organizational Simulation*. New York: Wiley. Both apply lessons of effective coordination across people to machine agents. For the basic dynamics of cooperation across multiple agents with goals that do not align automatically, see Robert Axelrod, *The Evolution of Cooperation*. Basic Books, New York, 1984 and chapter 1 of Ostrom E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. New York: Cambridge Univ. Press.

[60] McCabe, K. (2003). A Cognitive Theory of Reciprocal Exchange. In E. Ostrom and J. Walker (eds.), *Trust and Reciprocity : Interdisciplinary Lessons from Experimental Research*. Russell Sage Foundation, NY, 2003, p. 148.

[61] See the cases in Brown, *supra* note 14 and note 37.

their local goals as it exposes them to high risks when being called to account after outcome is known. Under threat from the system of accountability, each party defends their local goals rather than work toward aligning sub-goals to better achieve more global ends.

A second aspect of the Basic Compact is that all parties are expected to bear their portion of the responsibility to establish and sustain common ground and to repair it as needed.[62] Common ground refers to a *process* of communicating, testing, updating, tailoring, and repairing mutual understandings (this is much more than each party having the same knowledge, data, and goals).[63] Detecting and correcting any loss of common ground that might disrupt the joint activity requires a significant investment of effort to track other groups and connect one's activities to their activities and needs. The value of the Basic Compact is this shared willingness to invest energy and accommodate others, rather than just performing alone walled off inside one's narrow scope and sub-goal.

In general, achieving coordination requires continuing investment and renewal as parties to joint activity invest in those things that promote the compact and counteract those factors that could degrade it.[64] These results raise the danger that accountability systems based on sanctions will reduce the investment of effort in establishing, maintaining and repairing common ground and fragment activities that should be smoothly interconnected.

Trust in coordinated activity occurs when all parties are reasonably confident that they and others will carry out their responsibilities within the Basic Compact.[65] One danger of poor accountability systems is a breakdown in this form of trust. Factors that risk degrading the required coordination across the interconnected system of health care delivery increase risks of adverse events for patients.[66]

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[62] Klein et al., *supra* note 59.
[63] Clark and Brennan, *supra* note 59.
[64] Klein et al., *supra* note 59.
[65] Ostrom, E. (2003). Toward a Behavioral Theory Linking Trust, Reciprocity, and Reputation. In E. Ostrom and J. Walker (eds.), *Trust and Reciprocity : Interdisciplinary Lessons from Experimental Research*. Russell Sage Foundation, NY, 2003.
[66] Patterson et al., 2004, *supra* note 58.

Culture of Blame as a Poor System of Accountability

As the synthesis presented here establishes, from the cognitive sciences, the label "culture of blame" is a pointer to some factors that operate in cycles of accountability. In effect, it is a kind of system of accountability, but only one way to design and manage such systems. Analyzing a "culture of blame" in terms of the dynamics of this reciprocating cycle as begun above, reveals many of the factors that have been implicated in degrading performance, cooperation, learning, and therefore safety.

Conceptualizing the slogan of "moving beyond a culture of blame" as a poor system of accountability reveals that the systems approach does not mean an absence of accountability. It is a necessary part of our life as social creatures that we may need to explain our actions to others. The issue is to design and manage those relationships in ways that advance the common goal of very high levels of safety in a health care delivery system that also needs to be efficient.

Analyzing and studying cycles of accountability is very difficult because these results intrude on highly sensitive beliefs about oneself and others in different social roles. It requires us to consider how our image of how we call others and are called ourselves to account can be inconsistent with the actual empirical effects.

Innovating New Systems of Accountability?

Cognitive science can help stakeholders in health care to step back and look with fresh eyes at the effects of our systems of accountability. It helps us see the social dilemmas embedded in individual-focused (or sub-unit), culprit-based systems of accountability such as how the threat of increased sanctions can undermine cooperative and reciprocal trust relationships.

Can such analysis, coupled with legal and ethical scholarship, also help us innovate new possibilities? What system of "being called upon to give an account" would maximize organizational learning before patients are injured as a result of care? How can we move existing embedded attitudes and regulatory, quality assurance, civil and criminal systems toward new targets?

Some things are clear. After-the-fact analyses need to focus on how multiple contributors combined rather than isolating one "cause." Accountability systems must encourage constructive and sustained investment toward systemic change. Enabling and energizing independent, technical investigations following dramatic cases of patient injury to produce public accounts is a necessary base step. But proactive anticipation of how vulnerabilities to failure change is needed to avoid injuries.[67] To accomplish this, new studies are needed to understand how people can be "courageous" in focusing on safety risks even when such concern sacrifices current production or economic pressures.[68] Progress needs to be accelerated on how to measure and enhance organizational resilience so that organizations can better adapt as changes modify the risk of different vulnerabilities to failure or undermine the effectiveness of planned countermeasures.[69]

In this process of innovating systems of accountability, the conflicts noted above become a set of testing and measurement criteria. Do proposed changes enhance the flow of information to learn and anticipate vulnerabilities? Do they help connect and share responsibility across the distributed system of care? Do proposed changes help people see how multiple factors and organizational factors combine to create the conditions for adverse events? Do they connect autonomous computers and software engineering into the cycles of accountability? Do proposed changes reduce double binds and help people balance and resolve goal conflicts? Do they degrade the required functions needed for high levels of coordination and interchange?

While analysis of systems of accountability is a difficult and contentious process, the need to discover a different way to achieve simultaneously high accountability and high openness to information and learning is intense also. Poor systems of accountability degrade decision making and safety, as outlined above. New designs of systems of accountability are needed to help health care organizations anticipate paths to failure that

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[67] Woods and Cook, *supra* note 9.

[68] David D. Woods, *Creating Foresight: How Resilience Engineering Can Transform NASA's Approach to Risky Decision Making* (Oct. 29, 2003) *at* http://csel.eng.ohio-state.edu/woods/news/woods_testimony.pdf.

[69] Sutcliffe, K & Vogus, T. (2003). Organizing for resilience. In K.S. Cameron, I.E. Dutton, & R.E. Quinn (Eds.), *Positive Organizational Scholarship*. San Francisco: Berrett-Koehler, p. 94-110.

can arise as capabilities, organizations and technology change, *before any patient is injured.*