

association between DLCO and CSR severity, and put forward the hypothesis that DLCO is a novel component in the genesis of CSR. Additional studies will be necessary to clarify the relative importance of DLCO in the genesis of CSR.

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The Patient Handoff

Medicine's Formula One Moment

A patient hand-off is the transferring of patient care responsibility from one health-care professional to another.

Racing car pit crews are the best “handoff” experts in the world. They must be, as errors or delays cost driver lives or racing victories. Medicine, especially when practiced in an intensive care environment, is replete with clinical handoffs and the potential for medical communication error.

HANDOFFS AND PROCESS IMPROVEMENT: LOW HANGING FRUIT OR HERDING CATS?

Control of the risks associated with the “human factor” within the hospital environment remains a daunting challenge to our systems of health-care delivery. Foremost within this domain appears to be the potentially “fixable” but obviously complex issue of preventing communications failures. Focused attention to process improvement concerning systems of communication has been a major factor in the creation of virtually all “high-reliability” organizations.¹ It is reasonable to assume that analogous high reliability within the health-care system will never occur without serious attention, and likely redesign, of systems of communication at patient care interfaces where risk has been demonstrated. Can health-care teams ever hope to provide a consistency of process comparable to what occurs within the cockpit or air traffic control room, including when responsibility transfers from person to person?

UBIQUITY AND RELEVANCE OF THE HANDOFF PROBLEM

In health-care systems, handoffs occur between clinical locations (*eg*, ICU to the step-down unit) and disciplines (*eg*, cardiology to cardiac surgery) in addition to within a discipline (*eg*, cross-coverage by residents, nurses, or attending physicians). Requisite information must be provided between the ambulance crew and workers in the emergency department; between workers in the emergency department and those in inpatient services, ICU, operating theater, or other supporting diagnostic arenas; between workers in inpatient services; and between workers in inpatient services and subsequent out-of-hospital care providers. These “nodes of interface” from a systems perspective provide substantial opportunities for communication failure. Various factors including the increasing complexity of patient pathology, health-care treatments,

and duty hour restrictions are coupled with the increasingly frequent transfer of care between providers (especially within training institutions). These are causes for concern in the management of risk within the inpatient environment.

According to the Joint Commission,² inadequate communication between care providers or between care providers and patients/families is frequently associated with sentinel events. Communication failure was the primary root cause of 65% of reported sentinel events in 2006, as well as a similar fraction within the preceding 11-year interval.²

In one case-control study³ conducted within an urban tertiary care setting, 44% of 124 consecutive adverse events reported were judged to be preventable. Patients with potentially preventable adverse events were more likely than control subjects to be covered by a physician from another team at the time of the event. In multivariate analysis, the presence of cross-coverage independently correlated with the presence of potentially preventable adverse outcomes (odds ratio, 6.1; 95% confidence interval, 1.4 to 26.7). The likelihood of occurrence of a preventable adverse event was directly proportional with severity of illness (acute physiology and chronic health evaluation [APACHE] II score odds ratio per point, 1.2; 95% confidence interval, 1.1 to 1.4). This suggests that our sickest patients are not unlike the most delicate of flowers, thereby maximally susceptible to the risks imposed by “winds” of inadequate communication, knocking off the precious petals necessary for vigor and healing. Thus, the delivery of information appropriately in patient care (process) may be at least as important as the substance of care itself (content); certainly, at least, they are inextricably linked.

In a study⁴ conducted at the Minneapolis Veterans Affairs Medical Center, a natural experiment occurred within the admission coverage system of the internal medicine residency program. On alternate days, patients were either admitted to the hospital to the care of a senior resident providing continuous coverage within a team, or to a senior resident who transferred the patient's care to a different service on the following day. The patients in the cross-cover group had significantly more tests performed (with obvious implications for the costs of care). The median length of stay in the cross-cover group ($n = 74$) was 2 days longer than in that in the control group ($n = 72$) [8 vs 6 days, respectively; $p = 0.06$].⁴

At a tertiary care facility in New Zealand,⁵ 61% of house officers reported that they had encountered an adverse event at least seven times in their most recent clinical rotation that they could directly attribute to poor handover communication. Nurses reported similar issues concerning handovers in nearly 40% of queries. The majority of respondents in the study felt that an effective handover system

should include a set location for the handover, a standardized “on-call” sheet, and training related to handovers.

What are the implications for handoffs, for example, within the ICU, from the emergency department to the ICU, and from the operating room to the ICU, and for shift-to-shift coverage for physicians, nurses, and respiratory therapists? Within training institutions, as we seek to minimize patient risk by requiring sensible house staff scheduling, how do we optimize the transfer of information between caregivers who must, at increasing frequency and by mandate, handoff clinical care to another provider?

The analysis of malpractice claims suggests that issues associated with handoff communications failure are widespread and costly both in terms of adverse clinical outcomes and the financial costs associated with litigation risk. Among 240 cases of malpractice claims in which trainees were judged to have played an important role, teamwork breakdowns accounted for 167 of 240 contributing causes (70%), a larger frequency than that related to lack of technical competence (139 of 240 causes; 58%).⁶ Lack of supervision and handoff problems were the most prevalent types of teamwork issues, and both were disproportionately common among the errors that involved trainees.

Thus, in addition to the implications concerning the possible negative impact of duty hour restrictions, house staff appear to be at the front end of a learning curve that has serious consequences in terms of patient risk.³⁻⁹ Perhaps the absence of adequate curricular training goals pertaining to communications failure underlies some of this problem.¹⁰ When communications training based on high-reliability organizational practices have been incorporated into such programs,^{11,12} indicators of improved performance have resulted.^{10,11,13}

In this issue of *CHEST* (see page 158), Berkenstadt et al¹⁴ describe an active intervention in communications training that was provoked by a sentinel event. The intervention was composed of communications training in an experiential format, within a simulation center, serving as an institutional safety and quality laboratory for process improvement.¹⁵ Modern simulation facilities may serve as potent and effective communications laboratories because of their unique use of integrated digital audiovisual overlays, realistic clinical simulative settings,¹⁶ and dedicated educationalist expertise based on principles of adult learning theory.¹⁶⁻¹⁸ As described by the authors, simulation-based training provides for instructional design within a “mistake-forgiving” environment, providing a unique opportunity for team and interpersonal communications skills training. Such new tools also provide an opportunity for

formative and summative assessments^{19–21} of learners at all phases of training.

PRACTICAL SOLUTIONS AND RECOMMENDATIONS FOR IMPROVING HANDOFF COMMUNICATIONS

Within an analysis of 25 discrete incidents of communications failures associated with resident “signout,” the following two major types of dysfunction were noted: those associated with omitted content (*eg*, medications, active problems, or pending tests); and those due to failed processes of communication (*eg*, lack of face-to-face discussion).²² The risks of these two types of communications failure should be assumed to be present within complex systems, especially at system interfaces.

The Joint Commission²³ has identified a “standardized approach to handoff communications” as a national patient safety goal in the United States. Barriers to effective communication include the following: (1) physical setting (*eg*, background noise, lack of privacy, and interruptions); (2) social setting (*eg*, organizational hierarchy and status issues); (3) language (*ie*, differences between people of varying racial and ethnic backgrounds or geographic areas); and (4) the communication medium (*ie*, limitations of communications via telephone, e-mail, paper, or computerized records vs face to face communication).²⁴ The processes of handoffs should be interactive and intentional,^{25,26} a closed loop in terms of communications techniques.^{22,25} Closed-loop communication is a tool by which “readback/hearback” occurs within the process of information exchange, thereby confirming the real transfer of information. Within such a process, as adapted from the aviation industry, the following three phases of information transfer occur: (1) the “sender” states information concisely to the receiver; (2) the receiver reiterates the content of the message; and (3) the sender confirms that the information sent was received properly (or the process continues until there is mutual understanding). In the absence of closed loop communication, we have many times, during ICU rounds or, worse, during a code, witnessed a process in which a team leader requests an action, and a number of heads simply nod in acquiescence, only to have no action occur! Furthermore, communications should be supported by printed/electronic support tools.^{8,27–30} Automated updates appear to have added value in such electronic support tools,^{8,29} as do specific itemized action items.³¹

Last, we as caregivers must always recognize that the primary goal of any medical system intervention is to serve the fundamental need of our primary mission, namely, excellence in delivered patient care.

The mission drivers of health-care reform should not be subjugated to the allure of information technology processes in isolation from patient needs.³² A checklist, or a simulation center, for example, is simply a tool, not a solution. Bathed in intellect and mindfulness, it can become a powerful remedy; as one master clinician once exclaimed, “there is no substitute for intelligence!” Thus, the need for transparency in our processes and for accountability within our health-care systems exists in the facilitation of the science of health-care delivery. As this occurs, it may be possible to transform the value of the medical care we deliver to specific individuals as well as to global populations.

Value in health care, including from business models, has traditionally been viewed as follows:

$$\text{value} = \text{outcome/cost}$$

In the new and evolving era of patient safety, perhaps this model needs to be revisited and refined. In truth, value from the patient perspective should include indexes of patient safety (*ie*, minimizing risks) and service (*ie*, patient satisfaction) within a culture of caring. This definition surpasses that described above and better reflects the kind of health care our patients deserve. Furthermore, no care is delivered “in a vacuum,” but rather within a continuum over time. Real value in health care requires a consistency of expertise and acknowledges the continuum of such excellence over time. Thus, a modern modification of the above equation would be as follows:³³

$$\text{value} = \frac{\text{outcome} + \text{safety} + \text{service}}{\text{cost over time}}$$

Furthermore, despite the cultural differences among nurses, respiratory therapists, and physicians, and because the issue of communication skills is within the human factor realm, there is every reason to believe that the handoff solutions for each of these human groups will be more similar than different as new system solutions emerge. In addition to having the Formula One drivers (*ie*, practitioners) of medicine achieve excellence in patient care, we all need the Formula One pit crews of medicine to achieve that same excellence.

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