Computerized Physician Order Entry and Communication: Reciprocal Impacts

Richard Dykstra, M.D.

Division of Medical Informatics and Outcomes Research, School of Medicine, Oregon Health & Science University and Department of Internal Medicine, Northwest Permanente, Portland, Oregon

Abstract

Participant observation, focus group and oral history techniques were used to collect data from four distinctly different sites across the U.S. Data were examined initially to identify success factors for computerized physician order entry (CPOE) implementation. These data, reexamined for communication issues, revealed significant impacts on communication channels and relationships unanticipated by the implementers. Effects on physician-nurse interactions, pharmacy roles, and patient communications that vary by time and location were noted. The importance of robust bi-directional information channels between administration and staff was demonstrated to be potentially "mission-critical." The recommendation for implementers is "Plan to be surprised." Careful planning and pre-work are important but, no matter how much an institution prepares for the upheaval of CPOE, unforeseen consequences are inevitable. The presence of a prepared and capable implementation support group is essential.

Introduction

The publication of "To Err is Human" [1] focused national attention on medical error. CPOE has been seen as crucial to error reduction, has been mandated by the State of California [2] and is becoming a virtual mandate everywhere by recommendations from organizations like the Leapfrog Group [3]. CPOE seems clearly to be in the near future for everyone in health care organizations.

There is substantial literature on CPOE [4, 5] and error reduction [6]. Substantially less has been written regarding CPOE's effects on processes although process impacts can be critical [7, 8]. There are also few descriptions of impact on established clinical communication processes, [9, 10] and fewer still on communication during implementation [11].

The OHSU Physician Order Entry Team (POET) was established to identify success factors for CPOE implementation. Descriptions of factors or "themes" discovered in analysis to date are currently under review [10]. Analysis of new data identified new insights that were initially thought to be new "themes." With further contemplation it was realized that these new insights represented "cross-cutting themes" affecting multiple success factors and aspects of implementation. Communication is one of these newly identified "cross-cutting" themes and is now understood as a complex of processes. These processes are disrupted by CPOE implementation and this in turn affects relationships, communication channels, and ultimately, the success of CPOE.

Methods

Qualitative data were collected over the past five years during visits to the University of Virginia; El Camino Hospital, Mountain View, Ca.; and the Puget Sound VA Hospitals in Seattle and American Lake, Wa. More detailed descriptions of data collection and study sites are in press [12].

All data sets were re-analyzed (i.e. line-by-line coded using QSR-N5 analysis software) to examine how CPOE alters the full range of communication within institutions and how communication influences the success of CPOE. Although a multidisciplinary team conducted data collection and initial analyses, the author performed the reexamination of the data for communication issues. Three researchers already steeped in the data evaluated the results of the re-examination to provide validation for the observations presented here.

Results

Presentation of results will begin with local or personal issues then broaden to issues pertaining to the whole institution. The general themes are illustrated through quotations from the field notes and interviews. Quotes were chosen to represent themes based on clarity and brevity in expression of the theme.

An Illusion of Communication

For all involved in patient care, the introduction of CPOE presents a fundamental upheaval. There are obvious changes like electronic transfer of orders to the pharmacy. There are also less obvious yet important changes. For example, the process becomes less tangible. *"...docs picture it going into a black box, that it's a magic process, it's an illusion of communication"* There is a sense of near-infallibility:

"The computer gives a false sense that communication is happening. You enter it and think it went to the right place. With handwriting, you knew it hasn't gone anywhere, so you pick the phone." Over-reliance on system dependability leads to potentially dangerous assumptions: *"I'll occasionally call... Otherwise, I'll just assume that it's being done."*

A Substitute for Interpersonal Communication

Until the widespread adoption of electronic text communication and CPOE, little exchange of plans, ideas or orders could occur without some form of fairly direct human-to-human contact, but as face-to-face interaction is no longer the mainstay, the "personal" nature of communication diminishes. *"I think people now they substitute interaction with the computer for communication with individuals. The end result is 'oh put it in the computer rather than tell me about it."*

People need communication and interaction to understand roles and establish self worth. A team is more than the sum of individual roles. *"But we began to look at primary care as a team activity several years ago and tried to create an environment where people could work together."* Marginalizing team cohesiveness can have serious consequences: *"The nursing staff...it's affected their espirit de corps...because you start doing physician order entry and direct entry of notes and you move that away from the ward into a room and now you eliminate the sense of team, and the kind of human communication that really was essential...You create physical separation."*

Disturbance of Doctor-Nurse Communication: "There's not that physical presence"

Although the modern medical team has multiple members from pharmacy, physical therapy, nutrition, social work, etc., the Dr.-Nurse dyad remains central in the modern team but is affected by CPOE. *"One of the complaints we've heard is that there's not that physical presence. That people aren't around as much to ask questions to and get this interaction with." "There's a negative feeling about nurse/doctor communication, and nurses feel it's lost now."*

Although inadequate communication could lead to error more often it leads to additional effort to avoid error: *"...calling people for small things."* Provider remoteness has other implications for patient care. *"It's more difficult to get residents to see patients who... need to be seen, as the residents can put in orders from anywhere."*

Physicians feel the separation as well as nurses. *"...we're stuck at the computer all day long...entering words, communicating through the computer... the personal communication is worse. You know, actually speaking with the nurse."*

"There really doesn't seem to be any real interaction with the nurses during rounds" The significance of these channels of communication is clearly recognized by the participants. *"You know, I think that would just be helpful if, when you're talking about the patient, that the nurse is present. They can add things and they can hear what the plan is for the day."*

As clinical staff becomes accustomed to the new situation, communication strategies change and greater efforts are made. *"So I think a little bit extra effort on the part of [Physician Staff] and a little extra effort on the part of the nurse to make sure that we're touching base at least once a day as part of routine..."*

Impact on Medication Orders: a Three- way Communication

Medications, laboratory, and imaging orders present additional steps in the process with the pharmacy, lab or x-ray departments as intermediaries.

The pharmacist can be key to success. *"They know the meds better. They are the fail-safe mechanism."* For the pharmacy, illegible handwriting was the problem, but now it is interpretation and rechecking: *"...now all of a sudden we have a situation where, potentially, physicians are entering the wrong drug...and then it becomes our responsibility to make sure that the patient is getting the right medication."*

Communication volume may increase dramatically initially, much due to rework. *"I was struck by how many conversations [the MD] had by phone about a drug order – [s/he] hadn't had the time or taken the time to speak with the charge nurse or the pharmacist when s/he put the order in."*

Verbal orders have long been problematic in many respects, including accurate recording and co-signature. CPOE certainly has not solved these problems but may present a new imperative to face them. "Verbals" have never been popular (except perhaps with physicians). *"We did it years ago, too, we would discourage verbal orders. It's always better if it's written by the originator, for clarity and to make sure that everything is exactly as it should be."*

Medical Care Team-Patient

CPOE has altered information flow from the medical care team to the patient as well. Encounter information is usually available immediately after the visit and remains so indefinitely. Team members can use this information later to remind patients of plans. *"...in the outpatient area, patients frequently leave their provider visit with questions they haven't asked. They call back later and ...the pharmacist or the*

nurse, can...say well, you know, Dr, wanted you to do this and this."

Patients commonly seek care from several primary care MDs, naturopaths and specialists/sub-specialists, in a situation called "co-management." Usually these clinicians have little or no contact with each other and do not coordinate care. *"...many people are co-managed. They don't tell us about the physicians that they're going to, and they don't tell that physician they're coming here, and so you have the chance that people would get in trouble."*

Nonverbal communication, like eye contact with patients during the encounter, is important to clinicians and presumably patients. *"And patients will come in and they'll sit in the chair that's really behind you. So you can't look at the computer and the patient. And I always make the patient get up and sit so that I can kind of keep my eye on both of them simultaneously."*

Some communication improves: Medical Teams

CPOE initially impacts communication negatively in some areas but other areas may benefit from increased efficiency and support. For example, housestaff teams in a teaching hospital may find team closeness productive. *"I always come back to the team room. It's easier, quieter and I can keep up with other work at the same time. The presence of the rest of the team and the availability of [the resident] is also a factor."*

Problems vary by time and location

It's not surprising that the varying configurations of the health care team through the day and throughout the institution would influence CPOE impacts. First, consider evening and night shifts of nurses and physicians. *"It's not that it doesn't happen during the day, because it still does, but it's more likely to happen during the off-tours when the physician is not in the unit, or out admitting another patient and...[writes] an order, and three hours later the nurse finds out, because she just - she or he just happens to go in there an check orders."*

Second, some units, such as a bone marrow transplant unit (BMTU) feel a need to have more control over orders and medications than CPOE currently allows. *"BMTU orders are so unconventional that most 'conventional' staff has a hard time filling them. If orders are not entered and complete by 1800, the 0600 orders probably won't happen. This is a disaster in a protocol that is orchestrated to the hour." "BMTU orders need to be double or triple co-signed [the CPOE system] does not allow for that."*

Ambulatory Care Units (ACU) were created to allow certain brief procedures that are done most efficiently in a hospital setting to be done without actual admission. Workflow differs in that clinicians write the orders at their convenience but the patient comes in for treatment at the patient's convenience separating order writing and completion. *"In the [ACU], we hardly ever see an MD." "...everything is paper, except lab reporting; [order entry] from surgery is all paper, meds administered from ward-stock."*

"Hectic Environments:" unique problems

Hectic environments, for the purposes of this paper, include the emergency room (ER), intensive care units (ICU) and "code" or "advanced life support" situations (ALS). In contrast to outpatient or traditional inpatient units that are somewhat time-dependant, these environments are maximally time-dependant. Often there is barely enough time to make decisions, let alone document and enter in CPOE: *"Now, obviously, for emergencies they're yelling out orders and we're following them."* After the crisis, participants enter orders and document.

Since ICU care is expensive (often 2-3 times the regular bed charge) and beds are limited, there is pressure to stabilize and transfer as soon as possible. This means carrying out most orders as soon as possible, which may be more difficult with CPOE. *"...in a critical care unit, the physician, if they're entering new orders, they need to verbally communicate that, because... a new order could go in, and then I may not get to giving that stat dose of Lasix for two more hours because I won't know it's in there."*

In the ER, the interposition of CPOE between the person ordering and the person carrying the order out is a problem. *"Orders are written and handed to the nurse who will administer from ward stock. Lab is the same since the nurse is the one who will draw the lab anyway."* This close cooperation is needed for timeliness. *"There's no way that a physician writes the orders in the computer and the nurse is immediately alerted...as opposed to a piece of paper they can write on and hand to the nurse."* Working together closely can bring about a familiarity and synergy difficult to reproduce electronically. From fieldnotes:*"[The RN] asked 'do you want to give solumedrol 125mg?' 'Yes... as he entered the order. This to me was evidence that they had worked together for a long time"*

Bi-directional Administration-Staff Communication

Leadership values CPOE for improved economics and enhanced patient safety. Clinical staff has concerns about inefficiencies and loss of autonomy as well as patient safety. A common vision is a key to success: *"...with an implementation like a physician*

order entry system it helps to have that institutional common vision..."

Involvement of top management is one of the key themes identified for CPOE success. Management must both communicate vision to staff and listen to staff concerns and suggestions. Even the best of top-level administrators may be somewhat out of touch: *"I also got the sense that [the administrator's] not really in touch. I asked about doctor nurse communication and [s/he] isn't aware of any problems there. When one is on the unit, you can't help but be made aware of it."* What counts is the CEO's support when it is needed: *"Apparently, our CEO...is very committed to an electronic medical record and made sure that we had, you know...I mean, [we have] all that's needed."* Such support may even be the sustaining factor. *"...what kept us going here during the tough times is the fact that our administration...they realized the importance of keeping it going...give them the help, the support that they need to keep it going."*

Multiple information channels such as: electronic mail, "a message or tip of the day" in information systems, newsletters, publications, and department and general meetings are used in successful implementations. *"Clinical lab has a bulletin that comes out every month so if it has something to do with clinical labs, I can put it in that or I can use any one of numerous publications. But the two most frequently [used] are the mass email and on the system itself."*

In the absence of correct information, participants may generate their own: *"There was a lot of misinformation and wrong information, okay."* The absence of communication breeds distrust and disbelief: *"The administration's response to all the stuff preceding that was sort of small, at least from [the staff's] perspective...carrots or bones thrown to [the staff] and never really a true coordinated effort..."*

It is important that the staff be heard and that they perceive that they are being heard: *"But because, like I said, I think a lot of the anger came from being not heard, from feeling that they weren't being heard."* Opening lines of communication early is extremely important since, once issues are out of control, problems may prove intractable: *"Everybody would vent and yell and scream at them and they would sort of try to explain what they were doing and it was always never enough because the issue had already escalated so far out of control that you could never get ahead of it again."*

Disastrous situations are not necessarily due to inattention to detail or callous indifference. *"But the problem is that we were naïve, I think, and I say we as an institution...the ground work was not properly laid even though we had a quote, pilot and that sort of thing."*

Special people with personal, communication and teaching skills are needed. They must have credibility with the audiences and keep the staff informed of system changes and policies: *"He's a very patient individual, he's a good communicator, he has clinical relevance to the others because he works beside them..."*

Discussion

The purposes of this study were to examine 1) the impact of CPOE on communication in organizations and 2) how those impacts affect the implementation of CPOE. Prior studies have examined more pragmatic aspects such as impacts on utilization and process. During our analysis, communication emerged as a "cross-cutting" theme. Virtually all dimensions of communication were affected, from interpersonal to broad intra-institutional communication.

Communication within the multifunctional medical team seems to have suffered the most, whereas resident-physician teams have seen benefits. Physicians, now able to enter orders from anywhere, do so, reducing interpersonal contact with the floor team. This has adverse affects on team relationships. Team spirit and cohesion are undermined. Reduced face-to-face contact leads to rework when members of the team later need clarification. Resident-physician teams may actually benefit from sequestration in team rooms where they are able to interact more closely.

"Top-down" communication is strained by CPOE implementation. Channels that were adequate in times of stability may fail during the upheaval of CPOE implementation. All categories of staff need to be kept abreast of change. First, information is needed simply to do their jobs. Knowing when and how systems will be activated as well as whom to contact when those systems malfunction is essential. Second, a lack of information leads to an atmosphere of mistrust and rumor that erodes morale. Acknowledgement of staff contributions to and sacrifices for implementation success is indispensable as is feedback to staff that their suggestions, complaints and feelings are being heard, are valued and influence events.

"Bottom-up" feedback to administration and the implementation team is essential to keep the endeavor on track and on time. Problems must be addressed quickly. Delays are not easily excusable by those affected. Most institutions have individuals familiar with and enthusiastic about information technology in medicine who act as facilitators in the identification and reporting of problems.

Conclusions

Plan to be surprised! The institutions studied were all surprised and challenged by unforeseen snags, some worse than others. Form a strong, agile support team, fully prepared to respond to the unexpected challenges that will occur. Worse than not having a quick answer is a support system that freezes with no answer at all. Develop a network of superusers, champions and others who report problems quickly. The earlier problems are identified, addressed and remediated, the less negative impact. Also, work with this early-warning group to develop solutions.

In the long term, even a sub-optimally done implementation will likely succeed given human flexibility and adaptability. Careful preparation and communication can, however, avoid much user (and implementer!) grief. Once issues balloon "out of hand," regaining control will be difficult "Over-communication" early in the process could represent a solid investment in success. In support of this contention, the Menucha conference mentions communication throughout its recommended "Considerations for the Successful Implementation of CPOE."[13]

CPOE perturbs this stability by replacing known communication channels with new, often poorly understood channels. Trust in the "black box" leads to an "illusion of communication" which may mask errors. Participants may be unaware of communication problems. If implementers engender a climate of caution and "cross-checking" through person-to-person contact, this climate may not only reduce error but also lead to process improvement.

No matter how much an institution prepares for the upheaval of CPOE, understand that it will probably not be enough. One of the institutions studied prioritized remodeling of processes as a pre-implementation strategy but nonetheless had problems. The unanswerable question is obviously "How bad would it have been without that effort?" Review of the Davies' Award Winners and other case studies reveals that inattention to communication often leads to "early rejection" of CPOE. Note, also, that many Davies' winners overcame "early rejection" to become exemplars of success.

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