

# The Effects of Hands Free Communication Devices on Clinical Communication: Balancing Communication Access Needs with User Control

Joshua E. Richardson, MS, MLIS, Joan S. Ash, PhD, MBA, MLS  
Oregon Health & Science University, Portland, OR

## Abstract

*Hands Free Communication Device (HFCD) systems are a relatively new information and communication technology. HFCD systems enable clinicians to directly contact and communicate with one another using wearable, voice-controlled badges that are VoIP-based (voice-over IP) and are linked to one another over a wireless local area network (WLAN). This qualitative study utilized a grounded theory, multiple perspectives approach to understand how the use of HFCDs affected communication in the hospitals that implemented them. The study generated five themes revolving around HFCDs' impact on communication. This paper specifically focuses on two of those themes: Communication Access and Control.*

## Introduction

Hands free communication device (HFCD) systems are a unique information and communication technology (ICT). HFCD systems are characterized by three product traits: 1) Each HFCD weighs less than two ounces and is meant to be worn around the neck or clipped to a lapel thereby allowing the user to freely use his or her hands while communicating, 2) HFCD systems enable users to make outgoing calls, pick up incoming calls, or dictate other call-handling instructions by using specific verbal commands, and 3) HFCD systems provide wireless verbal communication among health care staff by utilizing Voice-over Internet Protocol (VoIP) over a Wireless Local Area Network (WLAN). HFCD systems are currently developed by Vocera Communications, Inc. (Cupertino, CA) and are therefore commonly referred to by the brand name.

HFCD systems are currently being implemented to improve how clinicians, particularly nurses, communicate with one another in the clinical setting. The systems are another technological layer of what Alvarez and Coiera describe as a "multilayered approach to communication" found in many of today's hospitals.<sup>1</sup> Telephones, faxes, and pagers are some of the other ICTs currently used in hospital communication.

Research on clinical communication exhibits certain recurring themes. Clinicians have demonstrated a preference for synchronous communication over asynchronous communication.<sup>2</sup> Clinical communication is also highly interruptive, resulting in additional strain on decision makers as well as hindering efforts to provide collaborative patient care.<sup>2,3</sup> These characteristics of clinical communication make the selection and use of ICTs in hospitals both difficult and critical decisions.

Taylor et al.<sup>4</sup> conducted focus groups and interviews with nurses to understand the requirements and ideal qualities of an ICT. They found that nurses valued functionalities such as flexibility, mobility, the ability to easily contact another person, and the means for managing interruptions. Thus, HFCDs possess several of the qualities that have been found necessary to conduct efficient and collaborative clinical care.<sup>5</sup>

HFCD systems have impacted communication in settings where they have been implemented. St. Jacques et al.<sup>6</sup> discovered that HFCD systems significantly improved the response time among anesthesiologists and CRNAs. However, staff expressed concern about the HFCDs' reliability and durability. Staff also expressed concern that the devices did not respond well when users were situated in noisy environments. Breslin et al.<sup>7</sup> conducted a mixed methods study to compare nurses who used HFCDs with nurses who relied upon overhead pages. The authors found that nurses significantly preferred HFCDs to overhead pages and that HFCD systems significantly reduced the amount of time nurses took to respond to phone calls.

St. Jacques et al. and Breslin et al. looked at response times and efficiency of use but did not look at how the use of HFCDs may have changed relationships within teams of users or across departments. New communication modalities have shown to have significant impact on roles and relationships, as demonstrated by Reddy et al.'s study of a wireless pager system.<sup>8</sup> To address these gaps in the literature on HFCDs, this study used qualitative methods to understand how the introduction and use of HFCD systems affected clinical communication in health care organizations. Research questions were: 1) How have HFCDs affected nurse, nurse manager, and IT

staff communication? 2) How have HFCDs affected communication in the health care organization? and 3) What were any unintended consequences associated with the implementation and use of HFCDs?

## Methods

This study relied on qualitative, grounded theory methods to describe and interpret the above three research questions. Grounded theory is a qualitative method in which the researcher iteratively reviews interview and observation data, applies labels or “codes” to data considered important, and does so until overall themes “emerge” from that data.<sup>9</sup> Grounded theory is well suited to handle “maximum variability” within a sample group, aiming to understand the range of perspectives and experiences relating to the topic of inquiry. Linstone’s model of multiple perspectives guided this study’s purposive sampling. Linstone argues that the evaluation of a technology should take into account users from multiple perspectives: personal, organizational and technical.<sup>10</sup>

Preliminary investigation led to the identification of three primary groups affected by the implementation and use of HFCDs: 1) the staff nurses who were expected to use HFCDs (the personal viewpoint), 2) the nurse managers whose responsibility it was to use and manage the use of HFCDs (the organizational viewpoint), and 3) the IT staff whose responsibility it was to use and support the nurses’ and nurse managers’ use of HFCDs (the technical viewpoint).

We used a snowball sampling methodology to recruit subjects from a local academic hospital and a community hospital. Snowball sampling relies on referrals from subjects themselves as well as sponsors from each institution. The institutions were selected due to their proximity to the researcher and the fact they each had one or more units that used HFCDs. A sample that sought maximum variability was employed so that it represented the many different types of departments and users within both institutions. IT subjects included technical and administrative personnel. Staff nurse and nurse manager subjects included those from ICU and OR environments. In all, twenty-six subjects were recruited for the study.

The first author conducted and recorded twenty-six semi-structured interviews. Twenty-three interviews were conducted face-to-face and the remaining three were conducted over the telephone. Interviews ranged from 12-35 minutes in length. Each subject was asked questions to elicit their understanding of why HFCD

systems were installed, how these systems impacted communication, and if these systems resulted in surprises or unintended consequences. The interview guide contained questions that used the term “Vocera”, the company that produces the HFCDs, since Vocera is the commonly used term at those sites. (Table 1)

|   |
|---|
| <p><u>History</u></p> <ul style="list-style-type: none"> <li>• How long have you been using Vocera?</li> <li>• Why do you think Vocera was something the organization wanted to implement?</li> </ul> <p><u>Problem Gap</u></p> <ul style="list-style-type: none"> <li>• What was communication like before Vocera?</li> </ul> <p><u>Vocera’s Impact</u></p> <ul style="list-style-type: none"> <li>• What effect has Vocera had upon communication among staff?</li> <li>• What effects has Vocera had upon communication in the organization?</li> </ul> <p><u>Unintended Consequences</u></p> <ul style="list-style-type: none"> <li>• What about Vocera has surprised you?</li> </ul> |
|---|

**Table 1: Guide for semi-structured interviews.**

Three observation sessions at each hospital followed the interviews to document HFCD use. Observations took place during morning, afternoon and evening shifts. The first author shadowed nurses wearing HFCDs in unit hallways as well as observed HFCD use from within nursing stations. Notes were taken with pen and paper. Observations and interviews were IRB approved at both sites.

All observation notes and interview recordings were transcribed and entered into NVivo, version 7.0 qualitative analysis software for coding (QSR International, Doncaster, Victoria, Australia). Using a combination of NVivo software and card sorting to organize the concepts, grounded theory analysis generated a total of five themes: Communication Access, Control, Training, Organizational Change, and Environment and Infrastructure. Study subjects confirmed the themes were trustworthy. Due to limits of space and time his paper focuses upon two themes: Communication Access and Control. The research describes the challenges users had in balancing these two aspects of HFCD communication.

## Results

### Communication Access

Communication Access refers to the degree to which people were able to communicate with one another without interrupting tasks. HFCDs were seen as a

crucial communication access tool for avoiding “[the] whole nightmare of trying to call... and then you can’t find the other person...” Without such easy communication access, one nurse described clinical communication as “a lot of hurry up and wait.”

The analysis identified seven subthemes that are part of Communication Access: 1) finding a phone, 2) locating a person, 3) obtaining help, 4) streamlining, 5) immediacy, 6) directness, and 7) dependence.

1) *Finding a phone* refers to how HFCDs reduced the need for users to search for a telephone. A nurse manager explained, “You don’t have to go find a phone. You can continue working and call directly.” Another nurse manager explained that HFCDs allowed “time savings and just being aware of where everybody is at all times.” A nurse manager elaborated that an additional benefit to HFCDs was that they “save a lot more time than trying to remember phone numbers all the time...”

2) *Locating a person* describes how HFCDs reduced the need users had to search for a person. A staff nurse related, “I use Vocera as much to find out where people are as I do to exchange information. ‘Where you at?’ ‘I’m over here.’ ‘I’m on my way.’”

3) *Obtaining help* refers to how users were able to use their HFCDs to access help from others. A nurse manager said, “...in cardiac you can get into situations a little bit where it’s nice to be able to punch a button and call for help.” A staff nurse explained that HFCDs “give me some comfort in that I can reach somebody quickly if [I] needed help.”

4) *Streamlining* explains that users felt HFCDs cut out multiple steps in their work processes. An IT subject related a story, “she called using her Vocera badge saying, ‘I’m with patient so and so, they don’t have their post-op instructions. Will someone bring them back down for us to the front desk?’ So instead of having to stop, go back upstairs, or stop [and] wait...it just streamlined that process so everything could keep moving forward in absence of that one piece of information.”

5) *Immediacy* refers to how HFCD users perceived HFCDs provided them “real-time” information. As one nurse manager explained, “[Staff] feel they’ll get an immediate answer.” A staff nurse noted that HFCDs “[open] up an avenue of being able to contact somebody immediately versus trying to stop what you’re doing...”

6) *Directness* describes how HFCD users could directly contact each other. A staff nurse related

directness as, “...you seen those commercials? ‘We cut out the middle man.’ That’s [what] I always thought once we started using Vocera...I just seem to cut out...the middle man, that extra phone call.” A nurse manager added, “I get a direct answer to a question, or I’m able to answer a question directly which I think has been very helpful in that there’s none of that running around and fire drills.”

7) *Dependence* upon HFCDs resulted from users’ perceptions of improved Communication Access. A nurse manager told the story, “the Vocera on my unit went down for some reason and [nurses] had to go back to the beepers...I came in the next morning and it was like, ‘oh my God Vocera went down!’...it was horrible...now [nurses] know how valuable it is.” And an IT subject commented that HFCDs are “so important to [nurses], they forgot normal communication.”

### Control

Control refers to users’ overall ability to manage the social and technical properties of HFCD communications in order to achieve safe and efficient work. A nurse manager explained HFCDs were “a tool to make your life easier, do not let it control you. So, you turn it off, you tell it ‘no’... don’t turn into its slave.”

### *Social Control*

Social Control refers to users’ ability to manage HFCD calls. The analysis identified four subthemes: 1) interruptions, 2) patient confidentiality, 3) conflicting communications, and 4) etiquette. Social Control of HFCD communications was an important aspect of use.

1) *Interruptions* resulting from HFCD calls were pointed out by many as a source of concern or frustration. A staff nurse described, “It’s annoying! It’s like...stop calling me! I know!...It can be frustrating.” Another nurse explained, “...it’s like an invasion of what you’re trying to do.” An IT staff noted, “[w]e found in fact the nurses felt they were interrupted more times with Vocera than they were without Vocera.” A staff nurse explained that she had a “love-hate” relationship with HFCDs because the “additional information from calls require[d] nurses to know how to prioritize more” which required a new “skill.” She added, having an HFCD “changes the psychology of nursing.”

2) *Patient confidentiality* was noted as another concern with the use of HFCDs, for sensitive patient information could be broadcast to a group through the loudspeaker. A nurse manager said, “...a drawback is

*if you have to have a private conversation with somebody it's best that you talk on a phone.*" A staff nurse felt similarly and said, *"I think there's potential for [HFCD calls] being a HIPAA violation. If somebody uses a patient's name [during an HFCD call], most people don't, but it's happened."*

3) *Conflicting communications* were a nuisance when a user was already in a face-to-face or telephone conversation with someone and an HFCD notification came through thereby requiring the user to manage two or more communications at once. A staff nurse explained, *"...you've got all of these communications coming at you and you're just like [expresses frustration], 'I can only talk to one of you at a time!'"* A nurse manager explained HFCD communication channels can get mixed up, *"I'm on a call trying to get or relay information, and then to have another call come in...you get this beep and it breaks up the conversation that you're having..."*

4) *Etiquette* when using HFCDs was often referred to as lacking or needing further development among staff. A staff nurse complained, *"I think [HFCDs have] affected how we communicate with one another. I think we've gotten rude with each other."* At times calls of a negative nature were broadcast over HFCDs, *"[a nurse was] speaking negatively about another nurse. Well it got back very fast..."* The ability for users to attribute their own nicknames to others was difficult for managers to control. A nurse manager explained, *"[a male nurse] changed [a female nurse's] name to 'Betty' because that's what you call a cute snowboarder girl...that could be potentially looked at as harassment."*

#### *Technical Control*

The second aspect of Control, Technical Control, describes users' ability to manage the technical use of HFCDs. The analysis identified two subthemes of technical control: 1) speech recognition, and 2) ease of use.

1) *Speech recognition* referred to users' perceptions of how well the voice commands of the devices could be controlled. An IT subject was impressed with the HFCDs' ability to recognize speech, *"...it's remarkable how well it does with different accents" but also remarked, "there is a frustration level if you can't remember the exact [commands]."* A staff nurse relayed, *"...it's very difficult to get a hold of somebody because you're not pronouncing [someone's name] the way that Vocera understands it."* Upon observation a staff nurse attempted to call the pharmacy repeatedly but was unable to do so

because she did not specify which one of five pharmacies she intended to contact. The HFCD did not prompt her to make the appropriate selection.

2) *Ease of use* in terms of initiating or receiving calls was praised by many. A staff nurse explained, *"It's such a simple device...[I]t's pushing a button the size of a dime. I mean how simple can that be?"* Another staff nurse found it simple as well, *"Push a button and go."* And another concluded, *"it's really user friendly so there isn't much of a [learning] curve."* One nurse complained, though, that the small screen on the back of HFCDs made it difficult to read phone extensions.

#### **Discussion**

From the viewpoints of IT staff, nurse managers, and staff nurses, HFCDs benefitted users by providing improved communication access. Users perceived that HFCDs allowed them to find staff and obtain help in a more direct manner than when previously relying on communication technologies such as telephones or overhead pages alone. These properties of HFCDs convinced most of the subjects that they had become dependent upon HFCD communications and would not want to work without them.

In this respect, HFCDs fulfilled the communication needs that previous research has shown are required in clinical settings.<sup>4,5</sup> Studies have shown that clinicians have a high reliance, if not an overreliance, on synchronous communication channels with conversation being the primary choice. Clinical users have a need to contact others based upon their roles, i.e. respiratory therapist, in addition to names alone. Also, clinical users require a technology that is as mobile as they are and allows users to contextualize and prioritize messages, say, by recognizing the tenor of another's voice.<sup>8</sup>

Yet nurse managers, and to more of an extent, staff nurses described tradeoffs associated with HFCD communications that IT staff did not discuss as readily. Nurse managers and staff nurses described the challenges associated with developing and maintaining control over the number, timing, and proper use of HFCDs for communication.

Issues of technical control mostly revolved around a central component of HFCD communication which was to be able to effectively use the voice recognition software. Establishing communications with another person depended on the HFCD accurately understanding the user's voice commands. Users described HFCDs as being generally effective but also expressed frustration at the devices' inability to understand commands or to recognize the names of

others, particularly if a user found a name difficult to pronounce. Observation of users whose commands were not understood confirmed the frustration that users felt towards his or her HFCD. Furthermore, as in the example of the nurse attempting to call the pharmacy, if a user did not use the required command then that user's call had little to no chance of going through. HFCDs provided users little guidance towards the preferred commands or to correct users' commands once given.

Maintaining effective communications while having a sense of social control was brought up by a number of users. Insuring that confidential patient information was not broadcast was a concern by many subjects; however, observations did not yield one instance when patient information was broadcast over an HFCD. One suggestion for addressing patient confidentiality was for users to introduce each call with the question, "Is now a good time to talk?" It was said that absent a technical solution, some nurses were taking it upon themselves to address one another in such a way. Interruptions were also singled out as a source of frustration as users were unsure when and in what situation their HFCDs would ring. Some nurses explained they would be in the middle of care consults with families when an inappropriate HFCD call would come through. As many from IT staff pointed out, HFCDs are equipped with a button to prevent calls from coming through. Staff nurses, however, described conflicted feelings about placing their devices on hold for doing so may cut them off from the group and possibly prevent them from receiving valuable patient information.

Clark<sup>11</sup> argues that face-to-face communication channels, the form of communication heavily preferred by clinicians, rely on aspects of immediacy, medium, and control. Disrupting these communication channels through the use of ICTs such as HFCDs requires users to develop "special techniques or practices" to account for the disruption. The challenge of balancing communication access with control may require developing "techniques or practices" that enable one to balance the ability to access anyone with being accessible to everyone. As information and communication technologies link clinicians in the attempt to improve collaborative work, issues around balancing interconnectedness and autonomy may be an important area of further research.

### Conclusion

HFCD systems are an ICT that links users using VoIP over a WLAN. This qualitative study used grounded theory and a multiple perspectives approach to

understand the effects HFCDs may have in health care organizations. Users described having better communication access but felt they needed to develop skills with which to control that access.

### Acknowledgments

This work was supported by training grant T15 LM007088 from the National Library of Medicine. Thanks to Emily Campbell, RN, MS, Kenneth Guappone, MD, PhD and Carmit McMullen, PhD.

### References

1. Alvarez G, Coiera E. Interdisciplinary communication: an uncharted source of medical error? *J Crit Care.* 2006 Sep;21(3):236-42; discussion 42.
2. Coiera E, Jayasuriya RA, Hardy J, Bannan A, Thorpe ME. Communication loads on clinical staff in the emergency department. *Med J Aust.* 2002 Sep 16;177(6):333-5.
3. Alvarez G, Coiera E. Interruptive communication patterns in the intensive care unit ward round. *Int J Med Inform.* 2005 Oct;74(10):791-6.
4. Taylor D, Coakley A, Reardon G, Kuperman G. An Analysis of Inpatient Nursing Communications Needs. *Medinfo.* 2004;11(Part 2):1393-7.
5. Coiera E, Tombs V. Communication behaviours in a hospital setting: an observational study. *BMJ.* 1998 February 28, 1998;316(7132):673-6.
6. St. Jacques PS, France DJ, Pilla M, Lai E, Higgins MS. Evaluation of a hands-free wireless communication device in the perioperative environment. *Telemed J E Health.* 2006 Feb;12(1):42-9.
7. Breslin S, Greskovich W, Turisco F. Wireless technology improves nursing workflow and communications. *Comput Inform Nurs.* 2004 Sep-Oct;22(5):275-81.
8. Reddy MC, McDonald DW, Pratt W, Shabot MM. Technology, work, and information flows: lessons from the implementation of a wireless alert pager system. *J Biomed Inform.* 2005 Jun;38(3):229-38.
9. Glaser BG, Strauss AL. *The Discovery of Grounded Theory: Strategies for Qualitative Research.* New York: Aldine De Gruyter; 1967.
10. Linstone HA. *Decision Making for Technology Executives: Using Multiple Perspectives to Improve Performance.* Boston, MA: Artech House; 1999.
11. Clark HH. *Using Language.* Cambridge: Cambridge University Press; 1996. p. 9-11.