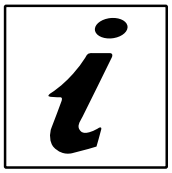
Information in practice



Communication behaviours in a hospital setting: an observational study

Enrico Coiera, Vanessa Tombs

Abstract

Objective: An exploratory study to identify patterns of communication behaviour among hospital based healthcare workers.
Design: Non-participatory, qualitative observational study.
Setting: British district general hospital.
Subjects: Eight doctors and two nurses.
Results: Communication behaviours resulted in an interruptive workplace, which seemed to contribute to inefficiency in work practice. Medical staff generated twice as many interruptions via telephone and paging systems as they received. Hypothesised causes for this level of interruption include a bias by staff to interruptive communication methods, a tendency to seek information from colleagues in preference to printed materials, and poor provision of information in support of contacting individuals in specific roles. Staff were observed to infer the intention of messages based on insufficient information, and clinical teams demonstrated complex communication patterns, which could lead to inefficiency.
Conclusion: The results suggest a number of improvements to processes or technologies. Staff may need instruction in appropriate use of communication facilities. Further, excessive emphasis on information technology may be misguided since much may be gained by supporting information exchange through communication technology. Voicemail and email with acknowledgment, mobile communication, improved support for role based contact, and message screening may be beneficial in the hospital environment.

Introduction

The healthcare system seems to suffer enormous inefficiencies because of poor communication infrastructure and practices. One estimate suggested that the American health system could save $30bn a year with improved telecommunications.[1] A retrospective Australian survey of hospital admissions found that communication problems were the most common cause of preventable disability or death, and were nearly twice as common as those due to inadequate medical skill.[2]

Yet despite this evidence, there has been little examination of the communication systems within health care. What recent work has been done, mainly in the promotion of telemedicine, is driven largely by technology rather than an understanding of clinical needs.[3] Given the paucity of existing information, we report an exploratory study of communication patterns in a hospital setting.

Subjects and methods

Setting—Our study was conducted between 3 March and 22 June 1995 at Frenchay Trust Hospital, Bristol, a 500 bed teaching hospital. Medical staff were equipped with radio pagers, and several telephones were available in wards. Staff did not routinely carry mobile telephones.

Subjects—We studied eight physicians from the general medicine department, ranging in grade from junior house officer to senior consultant, and two nurses from the medical wards while they carried out their routine duties. The subjects volunteered to participate in the study after we had circulated a description of the study method.

Data collection—A non-participatory and qualitative observational study was conducted.[4–6] Subjects were shadowed for 2-4 hours by EC or VT during the morning or afternoon of a normal weekday. A total of 29 hours and 40 minutes of activity was observed. Researchers kept a log of events and descriptions of the events. The subjects carried a small radio microphone that recorded their speech and were able to suspend recording or retrospectively exclude recorded material. Two subjects suspended recording—one to permit a confidential discussion with a patient and the other for a private telephone call. Observations were followed by interviews with subjects to obtain clarification of observed events.

Results

Call events

We identified a total of 96 call events involving the attempted use of the telephone or paging system, giving a frequency of one event every 18.5 minutes, with a range among subjects from no events to one event every 9.1 minutes (see table). The frequency among the five "busiest" subjects was one event every 11.6 minutes. Sequences of face to face conversation were harder to identify uniquely and were not recorded with the call events but captured within the qualitative data.

Editorial by Gosbee

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No of call events (No of successful connections) categorised by subject and call type among 10 hospital staff

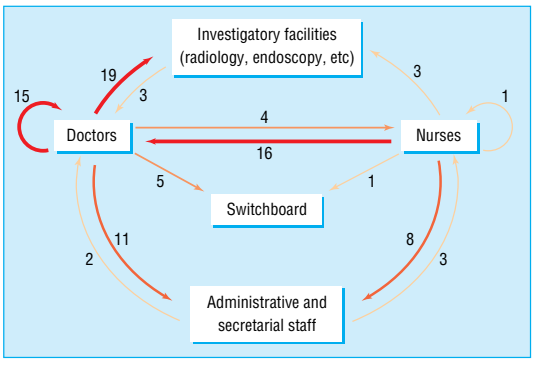
Subject and role	Page call		Telephone call		Length of observation (hours: minutes)	Total No of events
	Sent	Received	Made	Received		
7 (consultant)	0	0	0	0	2:55	0
2 (house officer)	0	0	0	0	2:59	0
1 (consultant)	0	0	1 (1)	0	3:15	1 (1)
6 (senior registrar)	0	0	2 (2)	0	2:05	2 (2)
9 (house officer)	3 (0)	3 (3)	6 (6)	0	2:41	12 (9)
8 (nurse)	4 (2)	0	4 (4)	5 (5)	2:09	13 (11)
10 (house officer)	0	2 (2)	11 (10)	0	2:55	13 (12)
5 (senior registrar)	0	4 (4)	10 (7)	0	3:39	14 (11)
3 (nurse)	1 (0)	2 (2)	13 (4)	1 (1)	3:23	17 (7)
4 (senior house officer)	1 (1)	10 (10)	9 (3)	4 (4)	3:39	24 (18)
Total	9 (3)	21 (21)	56 (37)	10 (10)	29:40	96 (71)

A person was successfully contacted in 71 (74%) of the call events. A third of 56 observed attempts to make a telephone call failed, usually because the line was busy. There is reason to suspect that the observers influenced staff behaviour and that the usual connection rate was lower. For example, while all of the observed staff answered their pagers (21 events), only three of the nine pages they sent were answered.

In 91 of the 96 call events we were able to identify the role of both the caller and receiver, including non-observed participants. Pooling these data produced a wider picture of the communication traffic between different groups in the hospital (see figure). However, since only two nurses were studied, the traffic between nurses and non-medical staff is undersampled and should not be compared directly with the other data.

Consultants were involved in almost no call events (one of the 96). While junior medical staff bore the brunt of calls received, the nurses sent a similar number of calls. There is a well recognised flow of communication events from nursing to medical staff,[7 8] and we also observed this, with 16 of the 20 events between nursing and medical staff initiated by nurses.

While it is recognised that medical staff receive many paging interruptions,[7 8] we found that medical subjects generated about twice as many outgoing events (43) as they received (23). Overall, subjects generated 65 call events and received 31, indicating that the medical and nursing staff were net generators of communication traffic in the hospital. Outgoing calls from all medical staff were directed to booking investigations (19), to other medical staff (15), and to medical secretaries and administrative staff (11). Thus, 42% of calls for medical staff came from their medical colleagues. The conversations ranged from requests for specific patient details to questions of diagnosis and treatment. While some information was obtained from formal sources like patient notes or laboratory results, in this study textbooks, journals, and other publications were not consulted at all.



Communication traffic based on call events between different groups in the study hospital, including non-observed participants in calls

It often required a series of calls to book an investigation. For example, subject 5, a senior medical registrar, made eight telephone calls (three failed to connect) and one page over 54 minutes to arrange one computed tomographic scan. Subject 8, a nurse, made two pages (both unanswered) to medical staff and two telephone calls to a clinic over 12 minutes in an unsuccessful attempt to organise an endoscopy. Such sequences usually involved the caller following a trail of telephone numbers, reflecting in part the decentralised organisation of some departments. Subject 5 had to speak to a variety of radiology administrative staff, radiographers, and radiologists before he could complete the scan booking.

Qualitative data

Most subjects generated and received multiple interruptions, either face to face or through call events. In the interviews after observation the subjects rarely considered the effect that a telephone call or page would have on the other party. Their actions could thus be characterised as habitual and selfish in that they valued completion of their own tasks over their colleagues' tasks. Some experienced staff were the exception.

All six calls to the switchboard, and most of the 19 calls to secretaries and administrative staff, were seeking contact information for individuals in specific roles (such as the cardiac surgeon on call). Some subjects were unsure about which role could assist them with a task (for example, "Who do I call to arrange a venogram?"). One specialist nurse who dealt exclusively with elderly patients was repeatedly paged in error to see patients outside her responsibility. The hospital's telephone directory was partly structured around roles but gave no indication of what tasks or responsibilities were associated with a role.

When interviewed some of the doctors indicated that they assessed the urgency of a page by the number of times they were called and the origin of the call. For example, a page from their home ward suggested to some that nursing staff were calling with minor tasks, and they would not reply unless paged twice in succession, which would indicate urgency. Similarly, failure to get a reply to a page within a short period was often taken to mean that no answer was coming, with the caller moving on to another ward.

We also found examples of inefficiencies with team communication. For example, a senior consultant tried to transfer a patient to another's team by delegating the request, involving at least two intermediaries. By the time the second consultant received the message it was substantially distorted and had the potential to endanger the patient. We also observed problems with cooperative tasks when team members were geographically separated. In one example, a house officer and senior

house officer were separated and duplicated an order for a portable *x* ray because they were unaware of each other's actions. The radiographer consolidated the two requests after calling for clarification.

Discussion

Our results should be understood within the limitations of the methodology adopted. Firstly, the study was observational, so the resulting qualitative descriptions may not have statistical significance. Further, only a small cross section of hospital workers was studied, and different results might come from another population. Finally, it is likely that subjects altered their behaviour because of the presence of observers.

High use of synchronous communication methods

During the study, staff seemed almost to favour interruptive communication mechanisms—face to face discussion, paging, or telephone—over less interruptive methods. Some nursing staff did write down tasks for doctors at the ward desk in preference to paging them, but this was uncommon. There are well known psychological costs associated with interruption, leading to diversion of attention, forgetfulness, and errors.[9–11] Further, interruption often requires rescheduling of work plans. The interrupt driven nature of the hospital work environment thus has the potential to generate extra costs in staff time and efficiency, although there was no evidence in this study that patient outcomes were adversely affected.

Interruption is related to the type of communication method chosen. Synchronous communication occurs when two individuals participate in a conversation at the same time, such as using the telephone. Asynchronous communication occurs when the exchange does not require both to be active participants at the same time, such as exchanging letters. It is a characteristic of synchronous communication that a request to speak creates an interruption, but with an asynchronous message the receiver chooses the moment to check or reply to the message. Why did subjects not use less interruptive asynchronous methods whenever possible? Several explanations for a bias to synchronous communication seem plausible (see below).

- The study hospital, like many at present, did not provide asynchronous channels such as voicemail or email,[12] thus biasing choice towards synchronous mechanisms.
- There seemed to be a need in such an event driven environment to deal with tasks as they arose. For a communication task to be "ticked off the list," subjects seemed to want an immediate acknowledgment of receipt of a message. Acknowledgment was possible with synchronous channels but not with the available asynchronous channels.
- Most subjects did not seem to reason about the consequences of their communication actions, their use of resources, or alternative approaches.

Preference for information through conversation

The high call traffic observed between medical staff (42%) is in accordance with a study of office based clinicians, in which about 50% of information came from colleagues, 26% from personal notes, and 12% from laboratory data.[13] Further support comes from studies of computer users, who preferentially consulted local "experts" for guidance rather than printed manuals.[14 15]

The reliance of the subjects on discussion to resolve information needs has suggested to others that this is in response to poor printed or computer based information sources.[13] Another hypothesis is that communication is actually the preferred mechanism for gathering information. Clinical problems are often poorly defined, and clarification can be obtained through conversation. Thus, medical staff may opportunistically interrupt each other because face to face discussion is highly valued but difficult to schedule, and any opportunity is avidly seized.

Role based contact

A quarter of call events were associated with identifying the name of an individual occupying a specific role, suggesting that poor support for identifying occupants of roles contributes substantially to the overall call traffic. The long sequences of information seeking calls we observed (such as subject 5's string of nine contacts to organise a computed tomographic scan) could have been shortened if information about roles and contactability was more accessible.

Communication policies often unsound

Some subjects had clear policies about the way they managed their communication—for example, to decide whether a page would be answered. Such inferences about the intention of caller or receiver were unsound on a number of grounds. Firstly, the assessment of urgency by doctors and nurses is likely to be different. Situations judged to be non-urgent by nurses have been shown to require medical assessment as much as ones deemed urgent.[16] Secondly, these paging policies were based on minimal information that could not support robust conclusions about the originators or receivers of calls, their level of busyness, or their intention. Since the paging system was the main channel for calls between medical and nursing staff, this is likely to be a problem area for communication.

Further research

Our results are based on a small study, and there is an immediate need to characterise accurately the size and form of different communication flows, including face to face conversations. For example, while past analyses of paging behaviour focused on the incoming burden created for doctors,[7 8] our data suggest that doctors and nurses are net generators of traffic. Secondly, we have suggested that communication traffic is apparently higher than necessary, resulting in an interrupt driven work environment. Our hypotheses about the causes of these interruptions need to be tested, and in particular we need quantitative analyses to find out whether the suspected negative consequences are actually having a substantial impact either on clinical workers or on patient care.

Our study also suggests that much could be gained by supporting information exchange through communication. While informatics almost exclusively empha-

sises computer information systems, the telephone is a part of a human information system and may often be preferred because it is better suited to many clinical tasks and settings than computer based solutions. The implications of this change in emphasis for the form and role of the electronic medical record are considerable.

Some of the communication problems we identified suggest ways of improving existing processes or introducing technological solutions to support the process of care (see below).

- There seems to be a need for individual workers to consider carefully the effects of their communication behaviour on their own efficiency and effectiveness as well as on that of others.
- Our subjects were highly mobile during their working day. The mobility of staff and the difficulty contacting these "moving targets" suggest that support for mobility through the use of wireless technology (such as cellular telephones) might be beneficial.[17]
- Early attempts to introduce message boards in order to reduce paging traffic have failed.[18] They required medical staff to travel to central boards, and nursing staff did not have any feedback about when messages were likely to be read or acted on. Providing messaging facilities such as voicemail and email might succeed in decreasing the reliance on synchronous channels, partly because they can be accessed wherever staff are working.[19] However, our study suggests that such messaging services may need to provide acknowledgment to reassure staff that messages have been acted on.
- Many of the communications observed were to occupants of specific roles rather than named individuals. A role based database akin to *Yellow Pages* could dynamically associate roles with people as assignments change and could be accessed easily on a computer network to reduce the effort and error of seeking such information.[20]
- Recipients of calls in our study had no information to screen calls meaningfully. However, information such as the caller's identity, perceived urgency of task, and nature of task can be attached to email and voicemail, and these features may provide an added incentive to their routine adoption. Currently, there is no means by which the recipient of a call can "pre-publish" their availability to help prospective callers, but such systems are technologically feasible.[20]
- Supporting collaboration among geographically separated team members to communicate the state of individual tasks may reduce duplication of effort and communication costs. For example, mobile computers could allow teams to work from a common task list.

Key messages

- We observed communication behaviour among 10 hospital based healthcare workers
- Communication behaviours resulted in an interruptive work place, which seemed to contribute to inefficiency in work practice
- Medical staff generated twice as many interruptions via telephone and paging systems as they received, and possible causes for this included a bias by staff to interruptive communication methods, a tendency to seek information from colleagues in preference to printed materials, and poor provision of information in support of contacting individuals in specific roles
- Staff were observed to infer the intention of messages based on insufficient information, and clinical teams showed complex communication patterns, which could lead to inefficiency
- We conclude that hospital staff may need instruction in appropriate use of communication facilities and that some communication technology—voicemail and email with acknowledgment, cellular telephones for mobile communication, improved support for role based contact, and message screening—may be beneficial

This study would not have been possible without the cooperation of Frenchay Hospital. In particular, we are indebted to the willing subjects who allowed us to scrutinise their activities and to Dr Ian Mackintosh who afforded us the authorisation and backup we needed. Julie Parker provided much useful guidance with the psychological aspects of this paper, and Jo Reid and Siani Pearson assisted us in the data collection.

Contributors: EC initiated the study, codesigned the study protocol, participated in data collection, analysed five subjects in depth, collated and analysed the quantitative data on call events, formulated the hypotheses for synchronous bias and information seeking, analysed communication policy and role based contact, and wrote the paper. VT codesigned the study protocol, participated in data collection, analysed five subjects in depth, analysed team communication patterns, participated extensively in the overall qualitative data analysis, and contributed to the paper. EC is guarantor for the paper.

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Conflict of interest: Hewlett-Packard is a manufacturer of computer equipment and medical devices.

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Netlines

Small is beautiful

- It's not just the big organisations that are using the web these days. Martin Schweiger, a consultant in communicable disease control, uses the web to publish a monthly newsletter about infectious diseases for general practitioners in Leeds (**http://www.schwefam.demon.co.uk/germ.htm**). While the web page design is none too fancy, the format seems to work, with some general practitioners preferring the web edition to the "dead tree" version.

Self help

- Patient Information Publications is a partnership of two general practitioners from Newcastle upon Tyne, who aim to provide information about health related matters that can be understood by non-medical people. Their Patient UK website (**http://www.patient.co.uk/**) provides a wealth of information for patients, including a section on self help and support groups in the United Kingdom (**http://www.patient.org.uk**).

Tale of two wisdoms

- WISDOM (**http://www.shef.ac.uk/uni/projects/wrp/index.html**) is a pilot project based at the University of Sheffield and funded by the NHS Executive to create an online environment, using the internet to train primary care professionals in informatics. The site features plenty of links and some online seminars on evidence based practice (**http://www.shef.ac.uk/uni/projects/wrp/seminar.html**), and is accompanied by an archived email discussion forum via mailbase (**http://www.mailbase.ac.uk/lists/wisdom**).
- WISDOM is also the name of a suite of databases produced by the Information Service at the Wellcome Trust (**http://wisdom.wellcome.ac.uk/**) which includes information on research funding, job vacancies, and science policy.

Urology site

- Chris Dawson, a consultant urologist in Peterborough, has recently developed a website for his department (**http://easyweb.easynet.co.uk/~c.dawson/index.htm**), which features a variety of information on urology.

Government information wants to be free!

- We, the people, can now watch our own government in action over the web, thanks to the online version of *Hansard* (**http://www.parliament.the-stationery-office.co.uk/pa/cm/cmhansrd.htm**). A new edition appears each day at 12 30 pm, and you can search an online archive to see what MPs have been saying about health or other matters—for example, a query with the search term "Barts" brought up 56 entries. Other selected House of Commons publications are on **http://www.parliament.the-stationery-office.co.uk/pa/cm/cmpubns.htm**, and the recent *London Review Report* is on **http://www.open.gov.uk/doh/lhsrev/lhsrevh.htm**.

The virtual autopsy

- The Department of Pathology at Leicester has produced a Virtual Autopsy (**http://www.le.ac.uk/pathology/teach/VA/index.html**) where you can examine an online cadaver, working through images and relevant signs until you are confident of the cause of death.

Finding the way

- If you want to include a map in your website or send people directions by email in the form of a URL, try **http://www.streetmap.co.uk**. You can call up road maps of anywhere in mainland Britain by post code, grid reference, or town name, and you can get detailed street maps of Greater London. For example, to locate the *BMJ*'s headquarters use this URL: **http://www.streetmap.co.uk/streetmap.dll?Postcode2Map?WC1H+9JR&title=BMJ+HQ&back=BMJ+Home+Page&url=http://www.bmj.com**. Also provided are links to local restaurants, pubs, cinemas, etc. A similar but more comprehensive service is available for American addresses from **http://www.four11.com**.

Food for Our Future

- For discussion of the benefits and anxieties arising from the application of biotechnology to food production see the Food for Our Future site on **http://www.foodfuture.org.uk/index2.htm**.

Rumours of war

- In the current "rumours of war" climate, readers might be interested to read a study published by the US Air War College on the "Battlefield Of The Future, 21st Century Warfare Issues" (**http://www.cdsar.af.mil/battle/front.html**), which covers not just biological warfare but also information warfare. Also worth visiting is the web version of a recent *Scientific American* article, "The Specter of Biological Weapons" by Leonard A Cole (**http://www.sciam.com/1296issue/1296cole.html**), which comes packed with links to relevant online data, an article on "The Great CyberWar of 2002" by John Arquila in *Wired* (**http://www.wired.com/wired/6.02/index.html**) and Bradford University's Department of Peace Studies (**http://www.brad.ac.uk/acad/peace/**) and associated Centre for Conflict Resolution (**http://www.brad.ac.uk/acad/confres/crchome.html**).

Campylobacter on line

- Sequencing of the genome of *Campylobacter jejuni* is currently under way at the Sanger Centre, near Cambridge (**http://www.sanger.ac.uk/Projects/C_jejuni/**). For a comprehensive list of links to online information on campylobacter, visit the new campylobacter genome website on **http://www.medmicro.mds.qmw.ac.uk/campylobacter/**.

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