Communication Observation Method Manual

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SECTION 1

Introduction

This manual describes the observational method and data analysis techniques for measuring communication load in the clinical environment. The method, known as the Communication Observation Method (COM), is based on the work of Coiera and Tombs[1] and has been further developed by researchers at the Centre for Health Informatics.

Why measure patterns of clinical communication?

Communication between health care providers accounts for between 60-90% of all information transactions within the healthcare system.[1, 2] Further, communication failures within the health system seem to be the large contributor to adverse clinical events and outcomes. In a retrospective review of 14,000 in-hospital deaths in Australia, communication errors were found to be the lead cause, twice as frequent as errors due to inadequate clinical skill.[3] Further, about 50% of all adverse events detected in a NSW study of primary care physicians were associated with communication difficulties.[4] A detailed analysis of clinical work in intensive care units found that while only 2% of the activity recorded consisted of verbal communication between doctors and nurses, it accounted for 37% of the error reports.[5] If we look beyond the raw numbers, the evidence strongly suggests that the clinical communication space has poor communication systems and poor practices.

In our previous studies, the COM was used to look at communication behaviours in two Emergency Departments. [6, 7] These studies demonstrated high communication loads carried by individual clinicians. Clinical subjects spent 80% of the time in communication, with 30% of all communication events classified as interruptions. In addition, it was found that medical staff spent around 15% of communication time involved in two or more overlapping conversations, highlighting high levels of multitasking amongst clinicians. These patterns of communication among clinicians were consistent with the results obtained from studies of British clinicians [1]. Coiera et al found that physician teams in a hospital setting were subject to high levels of communication interruption and appeared to bear a much higher communication load than necessary. Most importantly they found that simple interventions were effective in reducing communication loads. Thus, this body of work has highlighted the value of studying clinician communication patterns, allowing us to identify potential mechanisms, which may be amenable to improvement.

The next stage in this programme of research was to develop and rigorously test the COM to ensure its validity and reliability. A further study of clinical communication was undertaken in an emergency department[8] and these data were used as a basis for

validation of the methods reported in this manual. Figure 1 presents a summary of the COM.

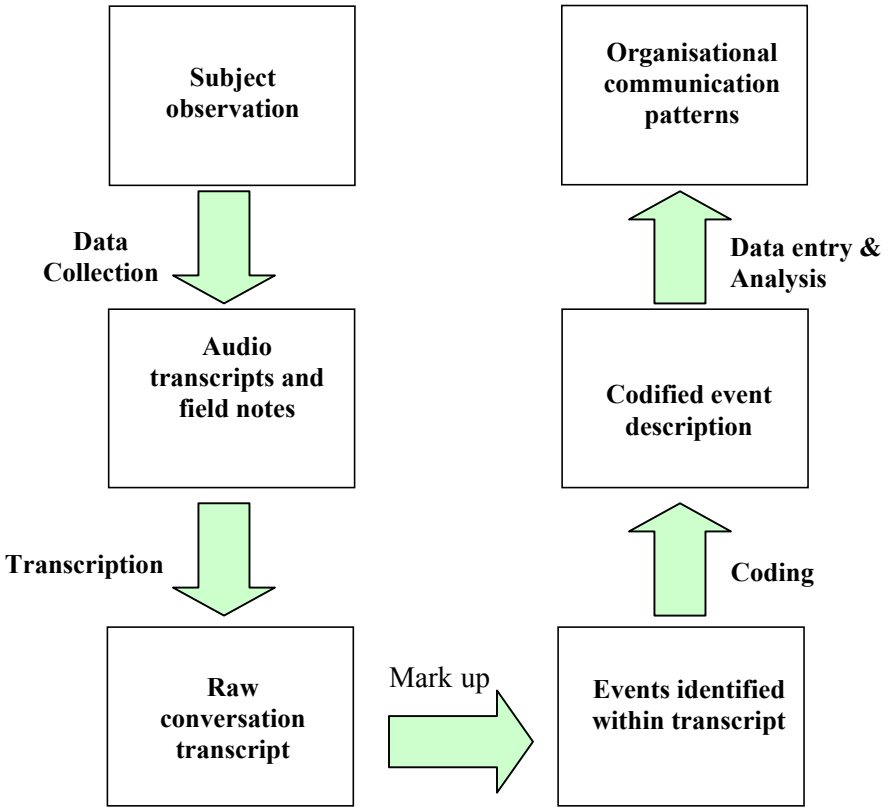
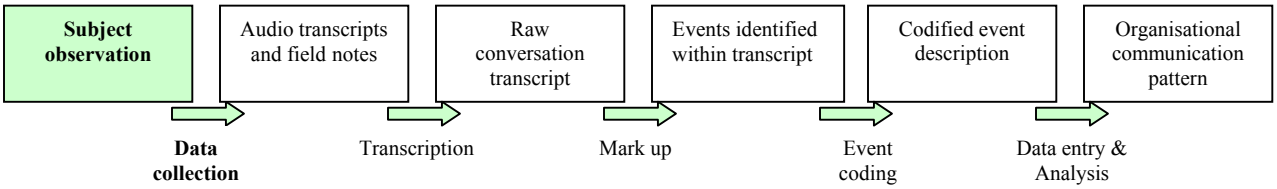


Figure 1. Summary of the Communication Observation Method (COM)

SECTION 2

Data Collection



The Communication Observation Method (COM) aims to measure the communication patterns within clinical organizations. Data are collected through observation of the routine work of individual clinicians. In this section we will focus on the data collection phase of the method and discuss:

1. Ethics
2. Sample selection
3. Staff recruitment
4. Observations

Ethics

Ethics approval needs to be obtained from appropriate institutions, for example research institution, hospital site.

Sample Selection

In order to measure the communication patterns within the clinical organization, select a sample of staff that is typical for that workplace. In research terms, the sample of staff form what is known as a prospective cohort.

The sample observed is a convenience sample and is taken from staff that are representative of the different roles working within a particular organization. For example, we would seek to recruit registered nurses and medical officers from a clinical setting.

In organizations, there will be different flows of communication that occur between staff in different roles, a decision to not observe individuals in a particular role may mean that part of the normal workflow of an organization is not observed. When the resources for a communication study are limited, it may be useful to pick staff from roles that are most likely to interact with a broad range of different staff, allowing some sampling of the communication patterns of roles that are not directly selected as subjects.

The sample may also need to be spread across different levels of seniority (for example, junior and senior nurses, interns, registrars and consultants) since the communication

patterns observed may be significantly different at different levels in an organizational hierarchy.

The determination of sample size is dependent on the purpose of the study and available resources. For example, a small initial sample can be used to do a survey of an organization to get a feeling for communication issues needing further study. An example of this type of exploratory descriptive study, which measured the communication load in two acute hospital settings, was undertaken by Coiera et al[1], the sample was 12, comprising six medical doctors and six nurses, with a total recorded activity of 35 hours and 13 minutes. This was an exploratory study used to identify patterns of communication amongst hospital-based staff.

Observational communication studies are resource intensive and the availability of research staff trained in clinical work and observational methods is a limiting factor for the size of a study. The observations are time intensive, typically studies may comprise of 8 to 20 subjects (total activity recording of 20 to 60 hours). Transcription of recordings are also time intensive with each hour observed requiring at least three hours of transcription. These factors need to be considered in the initial planning stages.

Recruitment

Prior to recruitment it is necessary to gain access to your target study site. This can be done through contacting and obtaining the co-operation of the appropriate directors/managers.

Potential avenues via which participants can be recruited include:

- **Staff education**: This provides a formal arena for the giving of information regarding the study. Flexibility is required on the part of the researcher to fit in with the work routines of your target area. For example, in our experience, liaison with the medical director, clinical nurse educator, nurse unit manager or an appropriate senior clinician should enable access to staff education sessions. Due to the nature of shift work it is useful to attend several of these sessions on different days and at different times in order to capture as many clinicians as possible.
- **Written information**: Can be displayed detailing the study together with the contact details of the researchers.
- **Liaison between researchers and potential participants**: Regular visits to the target observation area by the researchers have a two-fold effect. Firstly, regular visits generate interest amongst the staff and secondly, the researchers are accessible to the staff so that questions regarding the study can be addressed at a time convenient to the clinicians.

To support the recruitment process written information is made available to clinicians during the staff education sessions or at the request of the clinicians. It should provide detailed information on the study including the expected role of the clinician, the

expected length of the observation and the processes involved in the data collection (examples of the information for participants can be found in *Appendix 1 and 2*).

The time invested in the recruitment process is an essential part of the study. Experience has shown that recruitment of the subjects, particularly in the initial stages, can be a slow process. Clinicians may initially be reluctant to participate due to the nature of the observation data collection. Concerns that have been highlighted by clinicians relate to lack of privacy and embarrassment due to being recorded, patient confidentially issues, and concern that their own professional practice may be subjected to scrutiny. It is important to deal with each of these concerns. Emphasise that the purpose of the study is not to look at clinical skill or judgement and that no evaluation will be made of this. Additionally, reiterate that at all times the subject is in full control of the recording and can stop it at any time (see *Recording protocol*). Listening to the clinicians' concerns and discussing those issues that are important to them may reduce anxieties. It is also useful to talk about the potential benefits that may result from the study and set out your own obligations to the clinicians such as a commitment to give feedback on the study results. The trial or pilot stage of the data collection may be another valuable time to opportunistically recruit subjects. The pilot data collection can help to generate interest amongst the staff with the subjects involved at this stage being able to discuss their experiences with their colleagues.

Observations

Observational period: The length of an observation session is dependent upon the organization being studied. For example, a clinical service may need to be observed during the morning, afternoon, evening or night shift in order that data collected will include high and low activity times. It is suggested that the observations are limited to periods of around three hours in order that the observer can maintain optimal concentration. This time span is based on the experiences of researchers/observers involved in previous communication studies. If a subject needs to be observed continuously for longer periods, two or more researchers may take turns in observing, handing over at appropriate breaks in the workflow.

Observer preparation

The key elements of preparing for observations are:

Observer familiarisation: Researchers involved in the study need to be as familiar as possible with the work area that is going to be observed, as well as with the typical tasks that may occur. This will help to ensure that their recorded observations are as accurate as possible. Regular workplace visits prior to the actual study help the researcher to become familiar with the staff, staff roles and to the clinical environment. The time invested in the pre-observation visits also allows clinicians in the workplace to become habituated to the observer's presence, allowing the researcher to keep a lower profile when collecting the data. As non-participant observers, it is important to minimise the effect of observer presence in the clinical environment.

Determining and maximising inter-observer reliability: To ensure that different observers carry out the same procedures during observations, training sessions for the observers are conducted prior to the data collection phase. For example, a trial observation can be conducted with a volunteer clinician observed concurrently by two researchers for one hour. During this period the observers take field notes that are compared on completion of the trial. This process enables the measurement of inter- observer reliability and confirms that the researchers are following the same observational guidelines. Additionally it ensures the correct use of the audio equipment by both researchers.

Preparing the subject for the observation

Prior to the observation, each subject is given a detailed information statement about the study (Appendix 2).

Reiterating written information: The detailed information sheet provides a full explanation of the study, reinforces the confidentiality of the data and the subject's right to withdraw from the study at any time. This should be accompanied by a verbal explanation of how the observation will be organised including the equipment set-up as well as reiterating the recording protocol. Other explanations may include the setting out of any expectations, for example reinforcing the importance of the subject interacting as normally as possible with other staff and patients.

Recording protocol: Confidential material may be captured during the observation. Consequently many subjects may be reluctant to participate in the study because of fears of private conversations being recorded, breaching patient confidentiality or fears that recordings may be used in the future as evidence in legal proceedings. For this reason, we have settled upon a study protocol which vests ownership of the recordings and any transcripts made from them in the observed subject and their institution. Thus, participants are able to suspend recording or retrospectively exclude recorded material. The subject's microphone will record conversations with other staff members and with patients, the subjects are asked to obtain verbal consent from their patients, informing them that their conversation will be recorded. The patient can request the suspension of the recording at any time. There may also be some circumstances when the patient is unable to give informed consent. In that case it is stressed that the subject has full control regarding stopping the recording if, in their clinical judgement, they feel the situation is not appropriate. Recordings may also be suspended for personal reasons for example, phone calls and 'food' or 'toilet' breaks. If for any reason the clinician is unable to suspend recording, the observer can do so if deemed to be appropriate.

Consent form: The consent form is completed when the subject feels fully informed about the study and is happy to participate (Appendix 2).

Conducting the observations

During the observation the researcher "shadows" the subject, following them as they carry out their routine duties. The researcher follows at a distance to avoid direct interference with normal work, but remains sufficiently close to observe what is

occurring. The subject's conversations are recorded, and the observer takes field notes that describe the flow of events that are being observed.

Context-setting interview: Immediately prior to beginning the observation we suggest that the researcher interviews the subject, asking them to briefly describe what their role will be during the observation period. For example, the subject should make clear what they intend to do over the next few hours, where they might travel to, and what tasks they will undertake. This information allows the interviewer to more accurately interpret the events as they unfold over the observational period. The interview should not be very directive in questioning, and the specifics of the interview protocol will be determined by the purpose of the observation. If the purpose is to carry out a qualitative study to understand the communication processes of an organization there is greater scope for probing enquiry. If the purpose of the study is to carry out a specific study of a communication issue, then you may not wish to alert the subject to specific behaviours as this may result in a change in the participant's behaviour while being observed and subsequently bias the results. At the end of the observation a brief interview is carried out in order to verify the observed events.

Researcher behaviour during observations: The researcher should be discreet, and observe from a distance. In order to minimise the presence of the observer significantly altering the subject's behaviour, the researcher, when following subjects and recording field notes, should be as natural as possible for the given work environment.

Researcher equipment: The researcher carries a notepad, pen, stopwatch, the recording device and radio receiver, as well as wearing headphones that are plugged into the recorder. Listening through the headphones enables the researcher to hear the conversation of the participant at all times and additionally confirm the effective functioning of the equipment. Optionally, the observer can also wear a lapel microphone in order to augment written field notes.

Subject Equipment: Participant clinicians wear a lapel microphone and carry a radio transmitter, through which conversations with patients and other staff members will be transmitted to the recording device carried by the researcher (more details on equipment can be found in Appendix 3).

Field notes: During the observation period the observer makes field notes in addition to the recording. Field notes are a crucial part of the data collection, capturing information that is not recorded on the audiotape, but which is needed to explain the recorded events. The more familiar the observer is with the working environment, the more details of events observed will be apparent to them. For this reason it is advantageous if the observer has work experience in organizations similar to the one in which the study is being undertaken. Field notes may be recorded on a notepad or via a second microphone (depending on equipment being used). The field notes should be detailed so that the observation can be accurately recalled at a later date. The content of field notes is highly dependent upon the purpose of the observation, and different observations may focus on different attributes of the events that are observed. At the beginning of the notes the role of the subject, their unique and anonymous study identification tag, and the time of the beginning of the observation should be recorded. If the recording device has a time stamp

mark, this is recorded at the same time as observations begin. This allows the recording and field notes to be synchronised later when preparing the transcripts.

For a basic communication observation, the observer should record in their field notes the following items:

- The time of the beginning and end of each observed communication event (hours, minutes and seconds). It can be time consuming to determine from the transcript data when a conversation has finished, therefore, recording the end of event time in your field notes is important for the marking up of events later on (see *Section 4*).
- The individuals involved in each communication event (if known), since these can usually be easily identified visually at the time of observation, but may be difficult to infer from the transcripts.
- The communication channel used, if not obvious from the transcript e.g. use of a whiteboard.
- The purpose of the conversation that will not be captured in the transcript such as one that involves physical actions e.g. writing a medication order.
- When two or more communication events occur at once, eg writing in the medical notes as well as chatting on the phone.
- If the recording is suspended for any period of time then the reason should be recorded in the field notes.
- Any other relevant contextual information.

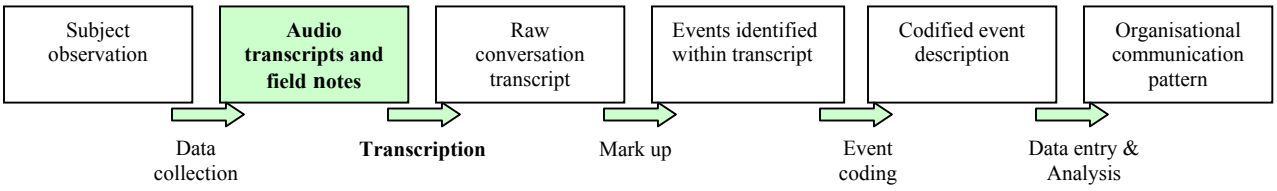
Section 4 – *Marking up and Coding of Transcriptions* contains further details on what constitutes a communication event, what channels might be used and so forth. Typically a large number of these attributes could, in principle, be captured in the field notes, but it is not feasible to do so. Consequently the field notes should focus only on those items that cannot be extracted from the recorded transcripts, or which may be ambiguous.

18 07 44	back at central station looking for notes
18 08 20	takes medications to pt in waiting room
18 08 40	patient discuss meds
18 09 57	end conversation
18 10 22	toilet break, transmitter turned off
18 13 03	continue recording
18 13 05	gives info to RN re pt
18 13 11	end conversation
18 13 13	writes in pt notes
18 15 00	looks up path results on comp (EDIS)
18 16 02	continues to write in pt notes
18 16 52	answers phone

Figure 2. Example field notes, showing notes written next to event times. Notes capture physically observable phenomena that cannot be captured on the audio record.

SECTION 3

Transcription



Observation audio data

Before commencing the transcription, the recorded data may need to be converted into a user-friendly format. At present, audio tapes are the most easily accommodated format, CDs probably come second (see Appendix 3). If using a mini disc recorder, it may be necessary to have access to a CD burner to burn the downloaded audio files from your PC (unless the transcriptionist has a mini disc player).

If using a mini disc recorder, the mini disc recording is made into an audio file using a software program (for example Cool Edit [9]). Via an audio cable, the mini disc recorder is connected to the line-in or microphone input port (depending on the volume control settings) at the back of the computer. By pressing play on the mini disc and record on the audio software program, the data are downloaded (in this case in real time) to your PC. Sometimes the soundcard and volume control settings on the PC need to be adjusted to accommodate this. Once the data have been transferred, they can be saved as a wav file, edited if required and then burnt onto CD. This will require a CD burner and blank CD-R discs.

The subject's conversations are transcribed verbatim to produce a text record of the audio data. It is helpful if the transcription is formatted so that consecutive voices are grouped together and that when there is no talking there is an indication of time passing. This makes the coding much easier later on. The process of transcription can be very time consuming. If time and resources permit, it is worth considering doing your own transcription because, although time consuming, it allows you to get to know your data very well which aids in the coding and analysis process. In larger studies it may not be practical to do your own transcription so employing someone else to do this may be an option (someone familiar with medical terminology is preferable). Obviously, there will be costs involved so this needs to be considered when working within budgets and applying for grants.

If employing an outside transcriptionist, it is important to establish a confidentiality agreement. If files are returned electronically it is important that all data within the

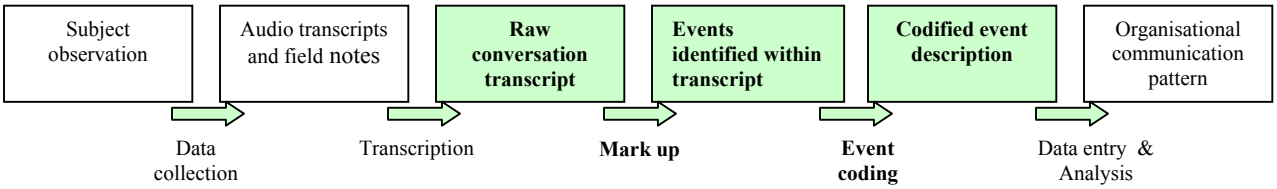
document and document titles are de-identified, that is, names of individuals and institutions should not be present within the text or document titles.

Observation field notes

The observer should type up their own field notes soon after the observation whilst they are still fresh in their memory, allowing informed corrections to be made if necessary. Having notes in electronic format makes them easier to work with later on.

SECTION 4

Marking up and Coding of Transcriptions



With the completion of the transcription phase, the raw data-gathering component of the communication study comes to an end. The goal of the next stage of the process is to identify and label communication events captured in the transcripts and field notes. This is done by distilling the raw data set into a refined data set. We can summarise this phase by noting that:

- The input into this phase is the raw data set that consists of the field notes written by the observer and the transcripts of the conversations of each subject.
- The output of this phase is a refined data set that consists of a condensed set of *descriptions* of the observed communication events, obtained from the corpus of transcript data that were observed.

For example, the following raw transcript fragment:

> V21: I've just put **** in four I was actually going out to put her in cubicles but she is just bleeding now, bleeding from both nostrils so popped her in four
> V1: Has she got a history of epistaxis?
> V23: Epistaxis in '99, cauterised by an, I think, a RMO
> V1: Ok
> V23: History of hypertension. It is 143 on 75 now … but now she is…
> V1: Ok thanks

can be transformed into a formal description of the observed event :

event number:	145
begin time:	14:06:11
end time:	14:08:19
subject:	registrar (V1)
other parties:	resident medical officer (V23), triage nurse (V21)
interaction type:	receive information, give request
channel:	face to face
purpose:	patient handover
interrupt:	yes

The particular description drawn from the raw transcripts is dependent upon the purpose of the analysis. For the purposes of the methods described in this manual, the interest is in understanding the type of interactions that occur between individuals, and the way in which those interactions may impact on work. So, there is never a 'correct' description of an event, just a description that best suits the purpose of the particular analysis.

The remainder of this chapter will describe the way in which communication events are first identified and marked-up in a transcript. Then a detailed description of the specific attributes coded within communication events will be provided.

Process of marking up a transcript into a set of events

When the transcription is completed, each transcript is read through and cross-referenced with the field notes whilst listening to the recording. This can be done directly by editing the transcript word document on your PC or on the hard paper copy if preferred. On the first read through, it is useful to mark out the communication events and incorporate the times from the field notes into the transcript. If certain event times have not been documented by the observer in the field notes, the times can be ascertained by re-listening to the event and working out the time from the recording.

The transcript is read, cross referenced and incorporated with the field notes: - the beginning and end of communication events are marked out - the times from the field notes are added to the transcript - each communication event is numbered - notes are made on the transcript regarding the attribute codes, that is, second party, purpose, channel etc

Table 1. Process of mark-up, coding and incorporating field notes into transcript

Transcripts are marked up into separate communication events

The basic element of communication process description is the *communication event.* Each transcript is marked-up into a sequence of individual communication events, each representing a unique interaction between the observed subject and their colleagues. Communication events include: face-to-face discussions, telephone conversations, messages written on paper, or entry of text onto a hospital form or the medical record.

A communication event consists of:

- a set of **messages**
- between a **sending agent**
- and one or more **receiving agents**
- for a **purpose**
- via a **communication channel**

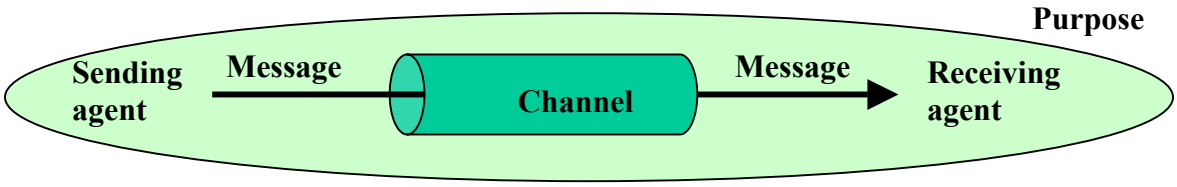


Figure 3. Components of a Communication event

Identifying the beginning and end of communication events

While the notion of an event seems discrete, it may be difficult in practice to determine that a new event has started, or that a current event is over.

A new event occurs either when:

1. A communication act starts in an otherwise event free period. This is the easy case, where nothing is happening, and then one of the observed parties starts communication.
2. During a period of communication, there is a change in the purpose, channel or participants in the conversation.

For example, a telephone call between two parties is a single discrete communication event. If one of the participants in a telephone call then puts the phone down and has a face-to-face conversation in the corridor with other members of a medical team this is a second and separate communication event. Similarly, a ward round involving several staff members and carried out over a lengthy period of time would be classified as an individual communication event. If, while having a face-to-face conversation, a pager goes off, then the pager represents a new event, which is considered separately from the concurrent conversation. The pager event is considered different as it occurs because a new party has initiated a communication interaction for a new purpose, and using a new form of communication channel.

Using these rules, we can now look at an example transcript fragment, taken from the observation of a Nurse Coordinator (RN coordinator) speaking with another nurse (RN1). During their conversation, an Intern begins a second conversation with the RN. These conversations are marked up as separate communication events in the transcript.

Event 1

09 40 37 RN coordinator: The patient in bed 11 needs to go to holding
RN 1: Is he going home then
RN Coordinator: he is…

Event 2

09 40 50 Intern: Sorry have you seen the man in bed 5
RN Coordinator: I think he's in the bathroom
Intern: oh, I need to take some bloods
RN Coordinator: he shouldn't be long
09 41 00 Intern: yep no problem

RN Coordinator: Yeh sorry bed 1 is going to go home he's just waiting for transport
RN1: oh ok
RN Coordinator: I'll give you a hand with the bed *<moves bed>*

An event terminates when:

1. The end of a communication event can be explicitly indicated in the transcript, for example - RN2: I'll just pop him in there; RN1: Ok, thank you.
2. One event directly follows on from another event. The beginning of the new event is also the end of the previous one, for example

Event 1	10 53 01	RN2: Do you want a hand moving her down?
End event 1	**10 53 05**	RN1: Thanks that would be great.
Event 2	**10 53 05**	RN3: Is Lignocaine out of stock?

3. The subject is no longer primarily committed to the current event's purpose.

This third rule can be problematic as the idea of 'committed' relies to some degree on the interpretation and judgment of the person marking up the transcript. The following examples should make the concept of commitment clearer. Consider the case where an individual is interrupted, and then later, when the interruption is dealt with, resumes the task that was initially interrupted. The way we code the transcript depends upon our interpretation of the commitment of the subject to the tasks captured in the events.

Event 1	Registrar: so tell me what has brought you in here today Patient: I was running for the bus and … *<a cardiac arrest is called>* Registrar: I have to go, I'll be back later
End Event 1	Patient: ok *<Registrar stops taking the patient history and runs to the cardiac arrest. He returns to the patient an hour later>*

In the example above, although the registrar eventually returns to take the patient history, at the time of the cardiac arrest emergency, the registrar is primarily committed to the emergency. So the communication event ends when the registrar leaves the patient's cubicle to attend the emergency. When the registrar returns later to take the patient history this is classified as the beginning of a new event.

In the next example, a medical registrar is taking a patient's history, and is then asked to take a phone call about another patient. He leaves the cubicle to take the phone call and then returns in a few minutes to continue taking the history. We interpret the primary commitment of the registrar remaining with the initial event, and the phone call as an interruption. Consequently, the patient history event does not terminate with the phone call interruption, but continues when they return from the phone call.

Event 1	17 05 06	Registrar: so tell me what has brought you in here today Patient: I was running for the bus and … *<RN interrupts and asks reg to take phone call>*
Event 2	17 07 03	RN: **** can you take this call.
End 2	17 07 06	Registrar: Ok. Registrar: I'll just take this call and be back in a minute Patient: ok *<Registrar goes to phone at nurses' station and takes call>*
Event 3	17 07 10	Registrar: Dr *** here, ….
End 3	17 09 15	Thanks, bye. *<Registrar returns to patient, continues history>*
Event 1 Continues	17 09 19	Registrar: Sorry about that, can you tell me a bit more about… Patient: Well….

Part of the rationale for this notion of commitment rests upon our interest in the impact of communication on humans and the organizations within which they work. Consequently, we are interested in the cognitive load that an event imposes on individuals. When an event remains the primary commitment of an individual, it remains active in their memory, and imposes a cognitive load. When they cease to be primarily focussed on a task, for example because they are drawn away to something else that occupies their attention overwhelmingly, then the memory resources associated with the old task are also assumed to be released.

Coding communication events

Once a communication event has been identified in the text, we then create a description of it. The description highlights features of the event that are then coded. As mentioned earlier, there may be many different features we could be interested in describing about an event depending upon the purpose of the study. Our interest has been in obtaining a high-level description of the overall communication traffic in an organization, and identifying the loads it imposes on individuals, as well as trying to understand the reason the communication is occurring.

The set of descriptors or *attributes* that we use to describe a communication event are:

1. *Event identification number* eg 123
2. *Start time* – hh:mm:ss
3. *End time* – hh:mm:ss
4. *Role* of each agent involved in the event eg triage nurse
5. *Channel of communication* eg telephone
6. *Type of interaction* eg give request
7. *Purpose of event* eg plan patient treatment
8. *Initiation or interruption*– whether or not the event has been initiated by the observed subject

Roles of those communicating

The role of the subject is often captured in their organisational title, for example nurse unit manager, staff specialist. The role of the second party will not always be obvious from the transcript so it is important to document in the field notes the roles of those with whom your subject communicates. For example:

19 06 34	V1: So just get an x-ray of her pelvis V12: Yeah are they doing a lateral
19 07 40	V1: **** I just spoke to your daughter P1: Oh did she ring did she…

Figure 4. Excerpt from transcript (study subject = V1)

19 06 02	looking at x-ray
19 06 34	**orthopaedic registrar**
19 07 33	end conversation
19 07 40	**patient bed 5**
19 09 50	end conversation

Figure 5. Excerpt from field notes

A communication event can involve multiple second parties. For example, when a patient arrives at the emergency department via an ambulance, the clinician accepting the patient may be communicating with two ambulance officers and the patient:

Event 1 **Ambulance officer**: This is Mrs ****, she has a history of chronic back problems, also has a cardiac history resulting in two bypass' in the early 90's… she hasn't taken her morning medications, obs are stable and not allergic to anything and I have bought all her tablets with her
RN: Let's have a quick look at your tablets
Pt: There are a few there
RN: One or two.
Ambulance officer: There might be some double ups, I just grabbed them
RN: Have you had an operation for your thyroid?
Pt: No
RN: Thank you. Will you be right with the transfer I will get our next ambulance
End event 1 **Ambulance officer**: No worries

Difficulties may arise in identifying the second party when the observed clinician is speaking on the telephone or if someone on the phone hangs up before the phone is answered. If the second party is not made explicit in the course of the conservation then the second party is coded as 'unknown'.

Other communication tasks where the identification of the second party has proven to be difficult include reading patient records, writing in patient records and use of white boards in the clinical area. The following rules are applied, in order to maintain consistency when coding:

- When reading or writing in the notes the second party is coded as 'staff unknown'

- When writing on a whiteboard within the clinical area the second party is noted as 'staff unknown'
- When writing letters the second party is marked as unknown unless this can be identified through the transcript or the identity of the second party can be clarified at an appropriate later time eg: at the post observation interview.

It is useful to be aware of the information systems that the organization you are observing uses, as some information systems have specified templates for regular tasks such as discharge letters. For example some emergency departments use systems that contain a template for discharge letters. In the majority of cases these letters are addressed to the general practitioner, therefore when a clinician is typing a discharge letter within that system the second party is coded as a GP.

Channel of communication

Communication may occur using different channels. Each event has the channel of communication coded. In most cases this will be a straightforward process of identification from a pre-defined list of common channels. For most purposes, the following list covers the majority of channels appearing in events:

Face to face conversation	Computer request form
Telephone	Paper medical record
Video-conference	Electronic medical record
Pager	Notice board
Voicemail	White board
E-mail	Computer
Post-it note	Paper source
Letter	Staff communication book
Fax	Admissions book
Paper request form	Text book

Table 2. Channels of communication

Deciding on the channel type used in an event is usually, but not always, straightforward. For example, there are many ways with which to page someone. One could call up a telephone paging service, dial up a pager service using a local system, or send a page using some form of email or text messaging service. In all these cases, the *final delivery channel* is the pager.

It is possible to develop codes that capture the complexity of both the various ways a message is created and then delivered, potentially involving multiple communication channels and communication services. However, for the purposes of the present analysis, we code an event according to the final delivery channel only, recognising that in some situations a more detailed analysis would be needed. Thus a letter of discharge that is typed on a computer will be classified by its ultimate delivery mechanism and therefore coded as 'letter'.

Purpose of communication events

Communication events are carried out to achieve some goal or purpose. The communication event can be associated with the completion of a task, like ordering a test. In our analyses, we capture purpose in our data by focussing on the task with which the communication event is associated. Assigning a task label to communication events allows us to identify whether some tasks are more responsible for problems in communication than others, or if there are general problems with the overall communication systems in an organization. For example, if interruption levels are high across all tasks then we infer that there is probably a general process causing the interruptions. If a specific task carries a disproportionate load of interruptions then we would focus attention on identifying mechanisms contributing to the high number of interruptions.

There is no 'correct' set of task types that can be used across all organizations, as the nature of work varies considerably both between organizations and for different roles within an organization. Consequently, prior to commencing analysis there is a need to develop a list of appropriate task types for the analysis of a given organization. One way to do this is to discuss the task types commonly carried out by staff from the organization. Next, with that list of tasks one can commence a preliminary analysis of one or two observations to see if the transcript throws up new tasks that are not in the initial list, or if the discussed task does not adequately capture what really occurs. In this way a working task list is developed iteratively. Table 3 contains a sample list of typical tasks from a clinical environment such as a hospital ward or emergency department

Ward round
Handover
Ward management
Admin/clerical
Patient management
Organise investigation
Get result
Prescribe medications
Education
Social

Table 3. Sample task list from clinical environment

Just as the particular task types vary, the number of task types also varies enormously. Further, tasks may be described at different levels of granularity. For example, an event could be coded as 'treat patient', which is very general. Alternatively this task could be broken into multiple descriptions or codes for example 'prescribe medication', 'administer medication', and so forth. The level of detail needed is dependent upon the questions being investigated or level of analysis expected from the communication study. As a rule of thumb, start with a list of no more than 20 different tasks, and only expand that list if the analysis identifies a specific set of tasks as being problematic in the organization, and requiring deeper analysis.

A special task type *study talk* is used to label interactions associated with the presence of the observer, and are not related to normal activities of the staff being observed. Typically we exclude study talk events from the final analysis, because they are an artefact arising out of the presence of the observer.

Example of study talk

16 53 16 Intern: And is this ****. Hi I am **** one of the doctors here I will be seeing you I am just involved in a communication study today so I have got this thing on so basically they are just recording the way we communicate around the department, if you do not want that to be on at any time you can just say so and there is no identification of yourself ok just letting you know so I will just have a little look at your x-ray and then we will take you around somewhere and have a look

End 16 53 38 P1: Alright

Interaction Type

As well as assigning a purpose or task type to each event, we can also categorise them according to the type of *interaction*. For example, some interactions involve asking for information, others for giving information. We like to capture this sort of specific information because it allows us to put together a picture of the information flows and bottlenecks in an organization. Thus, we might find that staff ask for information many times, but receive it infrequently, pointing out an imbalance in the information resources of the organization

The interaction type thus describes broad categories of information exchange:

- A request for information by the subject– is categorised as *give request,* that is, the subject is asking for information
- Receipt of information by the subject– is categorised as *receiving information*
- Receipt of a request by the subject– is categorised as *receive request,* that is the subject is being asked for information
- Sending information from the subject– is categorised as *giving information*

For example, a request is typically a question like ‘do you have any aspirin?” or ‘what is the capital of Bolivia?’. An answer is information supplied by the party asked the question, in response to the initial question. Most interactions fit into one of the above four categories.

Consequently we can create a set of four interaction type labels (Table 4):

	Give (send, create, write)	**Receive** (get, read)
Request (for information, task)	GR	RR
Information (regarding content, task)	GI	RI

Table 4. Matrix of interaction types

This categorisation is straightforward for interactions between conversing individuals in an organization, but is a little problematic when we think of an individual interacting with a passive source like a book or writing. For our purposes, if an individual has a question and goes to an information source where they read the answer (such as a book or a computer), then the individual has asked for information (GR), and then received information (RI). Similarly, writing information onto paper is either writing a request, for example asking for a laboratory test to be done by filling out a form (GR), or giving information (GI), for example writing down patient information into the patient record. Thus we classify writing in the patient notes as giving information (GI). Conversely, one could write a question to a colleague within the patient notes, and in this case we would classify the event as (GR).

Another possible interaction type is 'greet'. Greetings are part of social conventions that acknowledge another party or establish a joint commitment to talk. For example:

Example 1

<passing in the corridor>
RN: Hello ** how are you?**
Reg: Not bad, yourself?
RN: Good
<*end event>*

Example 2

RN: Hello ** how are you**
Reg: Not bad yourself
RN: I am good mate there are a few for you today I think,
One has just arrived that you would not have been told about
Reg: Ok
RN: Patient **** is from ****and he is febrile, tachycardic, he is a spinal patient
Reg: Right
RN: ….

Whether you choose to include 'greet' within your coding and analysis is again dependent on the aims of your study. If you are only interested in work related tasks occurring within an organization, then you can choose to exclude interactions that are

related to exchanges of greetings between staff that do not relate to a work task. However, if you are also interested in cultural aspects of the workplace the interaction type ‘greet’ may be beneficial to your analysis.

It should also be clear now that one communication event can have multiple interaction types. For example,

	(the intern is the subject)
18 53 50	Intern: How did you go with it? Did it look different?
	Radiographer: Yeah we have got a better shot this time
18 53 54	Intern: Thank you.

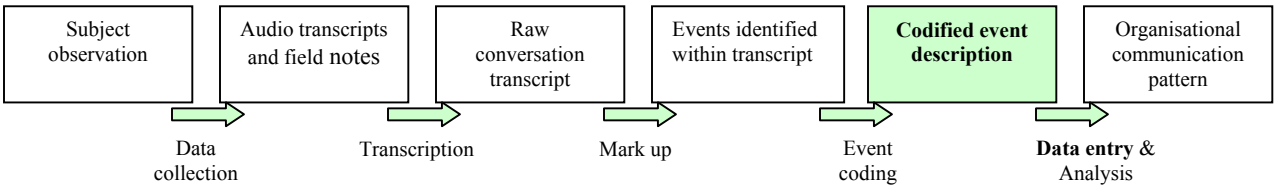
In the above example, the interaction types (from the point of view of the intern) are GR and RI.

Inter-rater reliability

If multiple researchers are involved in mark up and coding of the transcripts, inter-rater reliability should be determined. Carried out in the trial or pilot phase of a study, it allows any ambiguities within the coding to be reviewed and improved upon prior to the main study. Reliability may be calculated using percentage agreements between the coders [10].

SECTION 5

Data entry and analysis software



A custom-made data entry tool has been built using a Microsoft Access database (Figure 6). Each screen in the database contains the information for a single event. The beginning and end times together with the event number are entered and then a simple tick box system of data entry enables the input of the remaining coded attributes.

In addition, a database template in Access can be easily altered through the design function to suit the requirements of different study settings.

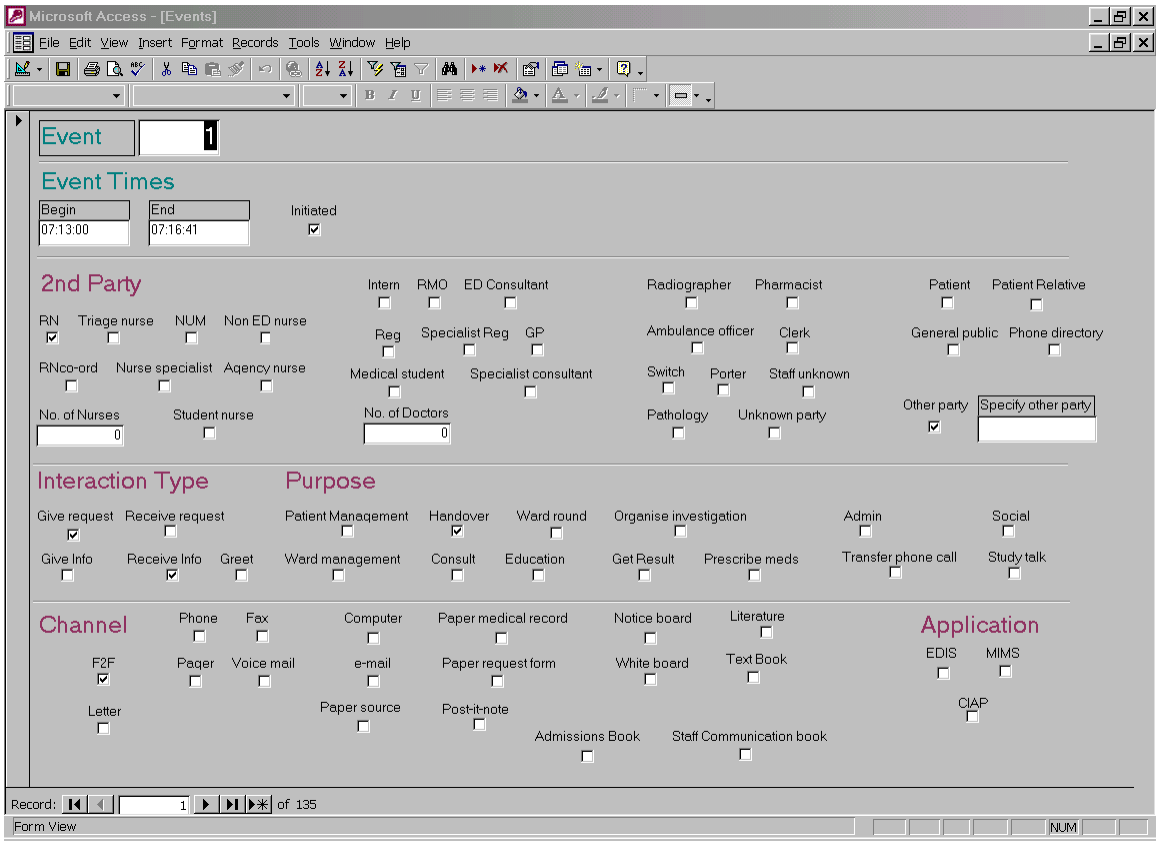
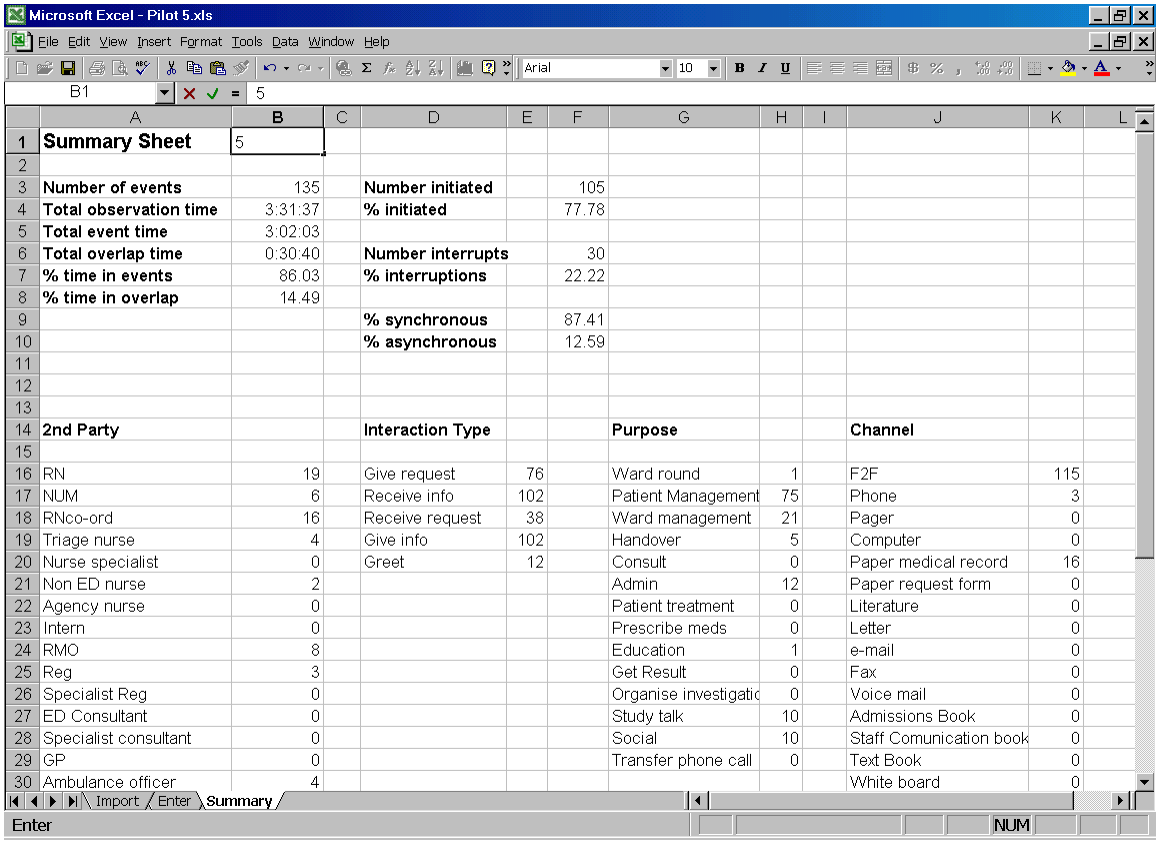


Figure 6. Data entry screen in Access Database

Data analysis

Whilst the Access database application is particularly good for data-entry purposes, the analysis capabilities are limited. It is therefore necessary to export the data into specific analysis packages.

For summary purposes an Excel spreadsheet template has been created (Figure 7). For other statistical analysis the Access data can be imported into SPSS or similar applications.



Microsoft Excel - Pilot 5.xls

File Edit View Insert Format Tools Data Window Help

B1 = 5

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Summary Sheet**	5										
2												
3	**Number of events**	135		**Number initiated**		105						
4	**Total observation time**	3:31:37		**% initiated**		77.78						
5	**Total event time**	3:02:03										
6	**Total overlap time**	0:30:40		**Number interrupts**		30						
7	**% time in events**	86.03		**% interruptions**		22.22						
8	**% time in overlap**	14.49										
9				**% synchronous**		87.41						
10				**% asynchronous**		12.59						
11												
12												
13												
14	**2nd Party**			**Interaction Type**			**Purpose**			**Channel**		
15												
16	RN	19		Give request	76		Ward round	1		F2F	115	
17	NUM	6		Receive info	102		Patient Management	75		Phone	3	
18	RNco-ord	16		Receive request	38		Ward management	21		Pager	0	
19	Triage nurse	4		Give info	102		Handover	5		Computer	0	
20	Nurse specialist	0		Greet	12		Consult	0		Paper medical record	16	
21	Non ED nurse	2					Admin	12		Paper request form	0	
22	Agency nurse	0					Patient treatment	0		Literature	0	
23	Intern	0					Prescribe meds	0		Letter	0	
24	RMO	8					Education	1		e-mail	0	
25	Reg	3					Get Result	0		Fax	0	
26	Specialist Reg	0					Organise investigatic	0		Voice mail	0	
27	ED Consultant	0					Study talk	10		Admissions Book	0	
28	Specialist consultant	0					Social	10		Staff Comunication book	0	
29	GP	0					Transfer phone call	0		Text Book	0	
30	Ambulance officer	4								White board	0	

Import / Enter \ Summary

Enter NUM

Figure 7. Summary sheet in Excel

Importing data from Access into Excel

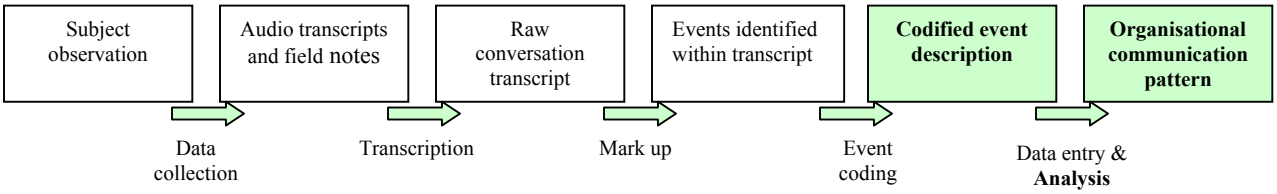
From the database you are working on in Access, it is necessary to export the table and save it as a text file. When formatting the file it is useful to set it up with column headings and as tab delimited.

Once this is done, open your Excel template, save it as an appropriate name eg pilot 1, and make sure the cursor is at the beginning of the 'Import' worksheet. Then click on 'data' at the top of the page, 'get external data', 'as text file'. Once imported, the summary worksheet contains a summation of the imported data.

On the worksheet labelled 'Enter', you will need to enter details such as the total number of events and end time. It is also useful to enter details regarding the data collection date, role of subject, who collected the data etc.

SECTION 6

Analysis



Once the observational data have been transcribed, marked up and entered into the database, data analysis can commence. In this phase, the data generated in the mark-up phase are interpreted according to a set of pre-defined rules to create a picture of the overall communication process in the organization.

Communication Load

The focus of analysis rules we present below is to determine the degree to which communication processes affect individual clinicians in their routine work, and specifically the workload generated by communication. This *communication load* on clinical staff is measured by calculating the values of a number of parameters that impact on the task load, and memory load, of individuals working in the organisation [11] [6]. Specifically, the data from all subjects are pooled and analysed to derive quantitative measures of:

1) The percentage of time spent in communication events for all subjects
2) The proportion of interruptions experienced by subjects over all communication events
3) The proportion of communication events involving concurrent communication tasks (multitasking)

Each of these three load measures can be derived automatically from the pooled communication event data, according to a predefined set of rules. The following sections will present the analysis rules for each measure of communication load.

Time spent in communication

The basic element of communication process description is the communication event. Central to our analysis is the time subjects spend in communication events.

The percentage of *time spent in communication events* is calculated as the total event time divided by the total observation time. For example a subject was observed for a period of three hours. Within this time they spent two hours and fifty minutes in communication

events. Therefore, the percentage time spent in communication events is 94% (i.e. 170 minutes/180 minutes * 100 = 94.4%).

Interruption rate

Communication channels may be either synchronous or asynchronous. Synchronous or interruptive communication methods are those that require the simultaneous interaction of the parties involved: the telephone and face-to-face discussions are two such methods. By contrast, an asynchronous method, such as writing a note or leaving a voicemail, allows the recipient to deal with the communication at a time of his or her choosing.

An *interruption* is defined as a communication event that is not initiated by the observed subject, and occurred using a synchronous communication channel such as face-to-face conversation or the telephone.

The *interruption rate* is the number of interruptions occurring as a proportion of the total communication events. For example if a subject has 20 communication events, and five events are classified as an interruption, then the interruption rate is 25% of the total events for that individual.

To calculate the *interruption rate* for the study cohort, add together the total number of interruptions and divide by the total number of events for all subjects to derive the population interruption rate.

Communication multitasking load

Multitasking occurs when a subject carries out two or more overlapping tasks at one time. This includes when a subject experiences two or more overlapping communication events at one time. This multitasking of communication tasks may be in addition to any other clinical tasks that may be active, such as handling medications or treating patients.

Communication multitasking occurs when a subject experiences two or more overlapping communication events at one time.

We measure the *communication multitasking load* by measuring the proportion of total communication time when two or more communication events overlap in time. For example, a subject is observed for one hour, and is engaged in communication events for 30 minutes. For ten minutes, the subject has two or more communication events active. The proportion of time in overlap (i.e. 10/30 * 100 = 33.3 %) is the time spent in communication multitasking.

Determining Event Overlaps

The amount of time a subject spends multitasking can be determined by considering the different ways in which events may overlap (Figure 8).

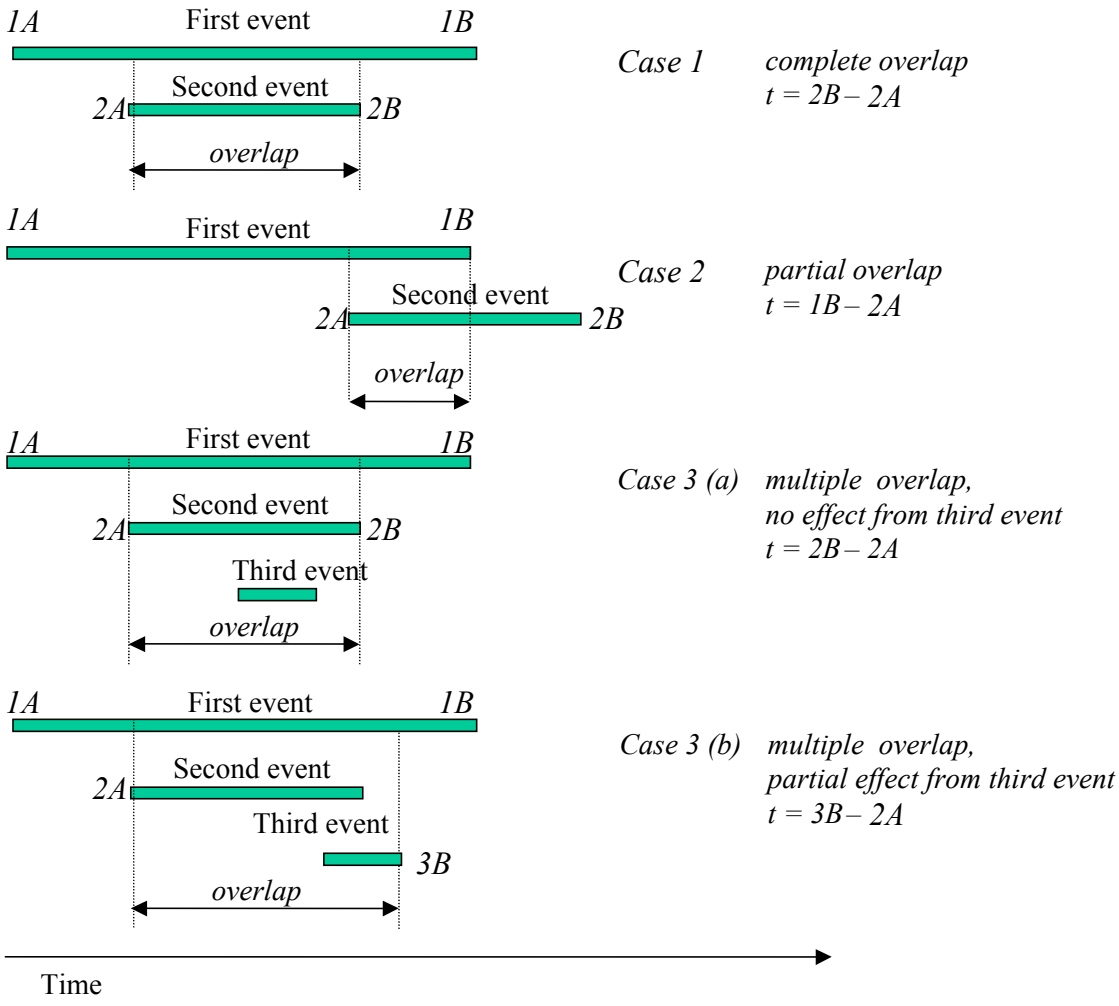


Figure 8. Determining event overlaps

1) Complete overlap – if an event occurs while a previous event is still active, and ends before the first event ends, then it is completely contained within the time boundaries of the first event. In this case the overlap time is the duration of the second event.
2) Partial overlap - if an event occurs while a previous event is still active, and ends after the first event ends, then it is only partially contained within the time boundaries of the first event. In this case the overlap time is taken from the beginning of the second event until the end of the first event.
3) Multiple overlaps –
    a) If a third event occurs while two other events are overlapped, then for the period that the other two events are overlapping, it has no effect on calculation of overlap time, as this would be 'double counting',
    b) However, if one of the first two events completes, and the third event is still active, then it contributes to the calculation of overlap time.

To calculate the proportion of time spent multitasking, add together the total time spent in overlap for all subjects and divide by the total time of all communication events for all subjects.

At present, the Excel template can determine the overlap time when two events co-exist, but a manual calculation of overlap time must be carried out when three or more events are involved in a single continuous overlap episode if deemed necessary (Figure 8).

More complex analyses of multitasking are possible. At present when two or more events are concurrent we do not note the number of concurrent events, as typically having three concurrent communication events is rare. However, it would be possible to determine the percentage of time spent on carrying out one communication event, two communication events, three events etc.

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Appendix 1 – Information for participants

Information Sheet for Participants.

Study: Clinical Communication and Information Use for Improved Patient Care

This study is intended to develop a better understanding of the appropriate application of technology for information access and effective communication in healthcare. The study will be based upon observation of clinical staff carrying out their routine duties.

The study will involve one researcher shadowing a subject (RMO/Nurse) for a period of approximately 3 hours. Shadowing involves a researcher observing your activities from a distance, and should not directly interfere with the completion of your duties. The technique will involve recording each subject's conversation with minimal or no questioning by the shadowing researcher. You will have the opportunity to exclude the researcher from observing any events that you feel are inappropriate. In addition, you may at any time decide to temporarily cease recording if you feel that sensitive information is to be discussed.

Data collected during the study will not be made available publicly. At the end of each shadowing period you, the hospital or its representatives may take ownership of the audiotape if they feel that it contains information that they would prefer not to be made available for the study.

Each subject will be asked to wear a small microphone probably attached to a lapel or tie which is connected to a transmitter approximately the size of a pager. Audio recording will also be made of brief interviews before and after the shadowing. You will be asked to describe your expected duties during the observation period. These interviews should only last about 5-10 minutes.

For further information about the study please contact Prof. XXX (ph.) or YYY (ph. or email:).

Consent from patients

During the study, you should interact as normally as possible with other staff. However, the issue of obtaining patient consent for recording is important, and we will request you to begin any interaction with a new patient with a brief statement to ensure we have their consent for recording. The points you should mention are below.

Points to outline:

- I am involved in a study examining communication and the use of information by doctors and nurses
- I am wearing a microphone which is recording what I say
- If at any time you would like me to stop recording our conversation just ask me to stop recording
- The information recorded on this tape will be transcribed in such a way that it is not possible to identify you

PHONE:
FAX:
E-MAIL:
WEB:

Letter to Participants

Dear

Thank you for agreeing to participate in our study: Communication Behaviours in the Clinical Setting. This study aims to investigate communication processes in a clinical setting with a view to improving patient care.

Our aim is to identify the specific needs of clinicians in the areas of communication and information technology. Our observations from this study will enable us to develop information and communication technology systems that will be useful to all members of the health care team.

One of our researchers would like to "shadow" you for approximately 3 hours as you proceed with your normal daily duties. During this time we will produce an audio record of your interactions with others and the researcher will record field notes. The attached sheet describes the study in more detail.

These observations should enable us to:

- Map out in detail the communication process in a clinical environment
- Identify any communication difficulties
- Ascertain the role of information access in clinical communication
- Identify the different roles and types of interaction characterising different members of the clinical team

We are very grateful for your co-operation in this project and assure you that every effort will be made not to interfere with your duties. We will also be subject to the usual confidentiality requirements.

As agreed one of the researchers will meet you in XXXX at.....on.....…

Yours Sincerely

Chief Investigator

Appendix 2 – Information statement & consent form

PHONE:
PROFESSOR FAX:
FACULTY OF EMAIL:

X AREA HEALTH SERVICE
X HOSPITAL

PARTICIPANT (HOSPITAL EMPLOYEES) INFORMATION STATEMENT AND CONSENT FORM

Communication behaviours in the clinical setting

You are invited to participate in a study exploring communication behaviours and patterns of information exchange by healthcare professionals in a clinical environment, specifically an Emergency Department or General clinic areas of a tertiary referral hospital. The study is part of a scoping project funded by Y. We hope to learn what are both the effective and ineffective channels of communication by, and among health professionals, and what events hinder information flow and feedback related to the delivery of quality patient care. You were selected as a possible participant in this study because you are currently employed as a nurse or medical practitioner in the Emergency Department of General clinic areas of X Hospital. To obtain accurate information on communication behaviours and identify events as they occur, a number of staff will be invited to have conversations recorded on audiotapes and observed by a researcher as they conduct their normal daily clinical activities.

If you decide to participate you will be asked to wear a lapel microphone for two to three hours, depending on your role, and the flow of events. During this time a researcher, XXX, will observe you.

Audio recordings of a brief interview will be made before and after the observation. The researcher will ask the participant to describe their expected duties during the observation period. The pre- and post-observation interviews will take approximately 10 minutes. All recordings will be transcribed for data analysis.

We cannot guarantee that you will receive any direct and immediate benefits from this study. However, it is hoped that the project will contribute to improved patient outcomes by improving communication within the clinical environment.

Within the limits of legal requirements any information that is obtained in connection with this study and can be identified with you will remain confidential. This includes the disclosure of information that may affect your employment status or incur penalty. The data from this study will be stored in locked cabinets/password protected computer files, accessed only by the research team, at the XXX

The results of this study will be discussed with the staff of the clinical area, reported to XXX (funding body) and published in the healthcare literature. In any publication, information will be provided in such a way that you cannot (or the institution) be identified.

Your decision whether or not to participate will not prejudice your employment with your current employer. If you decide to participate you are free to withdraw your consent and discontinue participation at any time without prejudice.

If you have any questions about the study please ask the researcher. Any additional questions that arise at a later date, Professor XXX (ph.) will be happy to answer them. You will be given a copy of this form to keep.

X AREA HEALTH SERVICE
X HOSPITAL

PARTICIPANT (HOSPITAL STAFF) INFORMATION STATEMENT AND CONSENT FORM

Communication behaviours in the clinical setting

You are making a decision whether or not to participate. Your signature indicates that you have decided to participate having read the information statement.

_____	_____
Signature of subject	**Signature of witness**
_____	_____
Please PRINT name	**Please PRINT name**
_____	_____
Date	**Nature of Witness**

_____
Signature of investigator

_____
Please PRINT name

REVOCATION OF CONSENT

I hereby wish to WITHDRAW my consent to participate in the research proposal described on the previous page and understand that such a withdrawal WILL NOT make any difference to my medical care or my relationship with the Hospital or my medical attendants.

_____
Signature

_____	_____
Please PRINT name	Date

The section for Revocation of Consent should be forwarded to XXX

Appendix 3 – Choosing equipment

Observations will be captured with the use of an audio recording device. Examples of these devices are tape recorders, mini disc (MD) recorders and digital audio-tape (DAT) recorders. There are both advantages and disadvantages to the various devices, however good quality recording is paramount. Technology will continue to change and new products are continually becoming available on the market. Ideally the observer is looking for a device that is relatively simple to use, small and light to carry around during the observations, able to withstand movement whilst recording and able to transfer data with ease, for example from a mini disc recorder to a personal computer (see *Section 3*).

There are both professional and consumer products on the market. The professional products provide good sound quality but in general are bulkier (as they are not designed as portable devices) and more expensive. Both professional mini disc recorders and DAT recorders record digitally and have digital outputs to download data quickly to the PC.

Consumer devices are often smaller and specifically designed to be portable (such as Sony MD Walkman® http://www.sel.sony.com/). However, even if the recording capacity is digital, the outputs are often analogue which means downloading data to the computer occurs in real time.

Often a compromise is necessary. A device such as a consumer mini disc recorder provides a good quality recording, is relatively simple to use and is small and light to carry around. The downside is that the only output is an analogue one. At present mini disc recorders/players are not so commonly used in Australia as compared to tape recorders. With this in mind, thinking ahead to the transcription is important. If the observer is doing their own transcription they can use their own mini disc player or transfer to computer using an audio software package (such as Cool Edit http://www.syntrillium.com/cooledit/). However, if outside help is being employed to do the transcription, the data needs to be in a format that the transcriptionist can listen to. Audio tapes are the most easily accommodated format, CDs probably come second. If using a mini disc, unless the transcriptionist has a mini disc player, it may be necessary to have access to a CD burner so as to burn the downloaded audio files from your PC. Depending on study resources etc, a good quality tape recorder will certainly be adequate.

In addition to the recording device, a radio microphone, transmitter and receiver are required. These can be purchased as a kit and, although expensive, it is worth getting good quality equipment. Be aware of the connectors - these need to plug into the recording device and, as the professional and consumer connectors are different, it is important to ensure compatibility (conversions can be made).

When using electronic equipment in a clinical environment, there is a risk that certain frequencies may interfere with hospital equipment. Therefore it is important to have your

equipment tested and approved by the hospital biomedical engineering department to ensure equipment does not interfere with patient monitors etc.

Some recording equipment may have an inbuilt timing device, if not, a stopwatch is required for the observer to time communication events.