

Making Chat at Home in the Hospital: Exploring Chat Use by Nurses

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ABSTRACT

In this paper, we examine WhatsApp use by nurses in India. Globally, personal chat apps have taken the workplace by storm, and healthcare is no exception. In the hospital setting, this raises questions around how chat apps are integrated into hospital work and the consequences of using such personal tools for work. To address these questions, we conducted an ethnographic study of chat use in nurses' work in a large multi-specialty hospital. By examining how chat is embedded in the hospital, rather than focusing on individual use of personal tools, we throw new light on the adoption of personal tools at work—specifically what happens when such tools are adopted and used *as though they were* organisational tools. In doing so, we explicate their impact on invisible work [77] and the creep of work into personal time, as well as how hierarchy and power play out in technology use. Thus, we point to the importance of looking beyond individual adoption by knowledge workers when studying the impact of personal tools at work.

Author Keywords

ethnography; chat apps; WhatsApp; hospital communication; nursing; work-life balance; workplace studies

CCS Concepts

•Human-centered computing → Empirical studies in HCI;

INTRODUCTION

As highly complex settings for communication, hospitals have long been studied in Human-Computer Interaction (HCI) [3–5, 49]. Workers in numerous and diverse roles must coordinate across shifts for 24-hour care [3, 10, 49]. Further, the work is safety critical, and the seriousness of errors makes facilitating good communication crucial. Hospital communication has thus been a prime site of technological intervention. Studies in HCI have focused on communication among providers, the flow of information among paper and digital artifacts, and the introduction of new devices [5, 41, 53, 62, 81, 83, 84, 93, 97, 98].

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In recent years, WhatsApp has gained popularity and has found its way into hospitals around the world [86]. This raises interesting questions for researchers in HCI and workplace communication. WhatsApp is a personal tool, typically used on personal phones, and its adoption in hospitals (and other workplaces) is worker-driven. That is, despite the variety of communication tools specifically designed for hospital workers, they choose WhatsApp for workplace communication. This is even in light of bans due to privacy and regulation concerns [29, 90]. This led Thomas [86] to call for a deeper investigation into how and why healthcare professionals use WhatsApp, and whether alternative organisational tools should be used instead.

In this paper, we seek to answer this call, by describing the findings of an ethnographic study of nurses' work in Shradha, a large multi-specialty hospital in South India. At the same time, we add to the emerging literature in HCI which seeks to understand how WhatsApp is becoming embedded in organisations and how it supports work practices [7, 39, 59]. Our study uncovers the unofficial, yet highly systematic way nurses and other workers leveraged WhatsApp. Despite only senior nurses using their smartphones on duty, all the nurses took part in work-related WhatsApp groups. We describe the work that nurses do through WhatsApp and how chat supports both nursing practice and the hospital overall. We explicate how chat fits into the spatial and temporal rhythms of hospital work, and how the hospital hierarchy is enacted in and through it. Whereas prior research into the use of personal tools and devices at work examined adoption as an *individual* phenomenon by knowledge workers, in this paper we examine adoption as an *organisational* phenomenon by frontline workers. That is, by examining how chat is embedded in the hospital, we throw new light on the adoption of personal tools at work. Specifically, what happens when such tools are adopted and used *as though they were* organisational tools, even when not officially sanctioned. In doing so, we explicate their impact on invisible work [77] and the creep of work into personal time, and problematize the idea of worker-driven adoption. We thus demonstrate the importance of looking beyond professional knowledge workers, and individual adoption, when examining the use of personal tools and devices for work.

RELATED WORK

Our study connects to multiple areas of HCI research. We begin by discussing communication in hospitals, focusing on

nurses' work, and then discuss workplace communication, chat, and its use in healthcare.

Communication Needs in Hospitals

Hospitals are communication intensive [4, 49, 50, 53, 83, 93]. Bardram and Bossen highlight the mobility work needed to make hospitals function: information and people must travel across increasingly specialized departments, locations, types of work [4], schedules, and levels of urgency [3]. Thus, asynchronous communication is important, with studies showing how shared displays like whiteboards can, to an extent, support unified understandings across different schedules [22, 93]. However, the collaborative and urgent nature of hospital work also necessitates synchronous communication which can be highly interruptive [22]. Hospital communication systems have moved from overhead pagers and telephones, to personal pagers, to mobile phones and two-way, text-based systems. Checking email or messages on mobiles supports easier communication of non-urgent information [56]. However, text may be less useful for conveying complex information, and can actually increase interruptions as messages are sent more freely than paging, which is reserved for emergencies [52, 56, 66].

Most research on nurses' communication in HCI is in the Global North¹, examining the effects of digitization on nurses' work practices [40, 41, 62, 83, 98]; departmental information flows and communication, and handovers [49, 83, 88]; and the design and impact of devices to support nurses' communication and information needs [82, 83, 95]. Cabitza et al. note the importance of redundancy in nurses' work, where nurses' awareness of ward status allows them to substitute for other nurses during a shift [12]. Studies have also emphasized the importance of understanding whether an interruption is urgent before attending to it [28, 50]. Lee et al. found that mobile phone calls are not conducive to nurses' work in an emergency department because they do not convey urgency, nor support group awareness nor broadcasting [50]. Meanwhile in the Global South, there is a dearth of studies on nurses' work, with more focus on nurses' perceptions of technology to inform interventions in nursing work [1, 48, 60, 68, 69].

Workplace Communication

Past studies of workplace communication have focused on how the increasing use of ICTs affects communication, collaboration, and worker satisfaction and participation [19, 26, 27, 54, 76, 80]. Studies of non-standard forms of work, such as "nomadic" work, freelancing, and self-employment [54, 65] highlight additional communication challenges, as workers navigate multiple and sometimes unfamiliar technical infrastructures. More recently, personal tools have begun to infiltrate the workplace. Studies examining individual workers' perception and adoption of personal tools find that workers value them [21, 42, 43, 75]. For example, receiving personal email

¹Global North refers to countries like the United States, Canada, Europe, and "developed" parts of East Asia that disproportionately control the world's resources. Global South refers to low- and middle-income countries in Asia, Africa, Latin America, and the Caribbean. See <http://bit.ly/globalsouthanalysis> or https://en.wikipedia.org/wiki/Global_South for examples of more critical analysis.

on a work account supports family connections [21]; a personal laptop allows workers to use helpful applications not permitted on work devices [42]; smartphones help clinicians reference key medical information [23]. These studies point to how workers use personal tools in creative ways, highlighting the need for greater freedom in technology use in the workplace [73]. However, there are downsides. Work-related communication on personal devices, especially mobile devices, can lead to blurring of work-life boundaries [14–16, 21, 78]. Tenorio and Bjorn argue that mobile chat technologies can enable workplace harassment to extend beyond the workplace, but also document harassment, all of which extends employers' legal and ethical responsibilities to the online realm [85]. In healthcare, there are an increasing number of apps targeted towards providers for use on personal devices [23, 61, 94]. However, personal phones may be used for non-work purposes, resulting in worries about distractions [58] and perceptions of unprofessionalism [23]. Scholl and Goth found that the use of personal cellphones meant that doctors might accidentally call others who are not at work that day, and nurses found it difficult to handle personal versus work notifications for them during surgery [74].

Chat at Work

Messaging has evolved over time, from SMS, to computer-based instant messaging (IM), to chat apps. Early studies of IM in the workplace [26, 34, 37, 38, 51, 63], found it was used for short interactions, often for setting up phone or in-person meetings [63], or longer discussions between frequent chat partners [38]. With the emergence of mobile chat apps, there has been some discussion of how chat impacts the organisational hierarchy, with multiple studies suggesting it affords less hierarchical communication [67], including in hospital settings, with junior doctors and interns better able to access expertise from experts and ask more questions [44, 57, 64]. However, chat cannot replace the work that hierarchy accomplishes, such as filtering relevant content [59]. Mobile chat apps like WhatsApp, WeChat, and Viber have particular relevance in workplaces in the Global South, in part because they work well with low connectivity and do not cost per message [2, 18]. Meanwhile, increasing smartphone penetration and cost-effective data plans have made free apps and smartphones a dependable alternative to expensive corporate accounts and work laptops in organisations. However, the role of WhatsApp and other tools in workplace communication in the Global South remains understudied.

Chat in Healthcare

The emergence of WhatsApp has led to a flurry of studies [13, 17, 31, 44, 46, 47, 55, 64, 87, 91, 92], primarily in medical technology and communications publications. The focus has largely been on physicians and experimental trials that test the effects of introducing mobile messaging apps, mostly in Europe. Findings include that chat has value as a channel for questions and answers, consulting, and quickly exchanging information about patients [13, 33, 44, 45, 47, 57, 64, 91]. When introduced to medical teams, WhatsApp made senior physicians' expertise more accessible to junior physicians [44, 57, 64], and junior physicians felt more comfortable sending a WhatsApp

message rather than a more interruptive page [44]. Kaliyadan et al.'s survey of dermatologists in India using WhatsApp found that being able to share images was a big advantage, although image quality was seen as a significant problem [45]. Finally, Kamel Boulos et al. [46] find that chat can help bridge temporal and physical distance in healthcare, drawing on studies such as Nardo et al.'s in Italy which looks at speed of response on WhatsApp or how physicians do not need to be at the hospital to answer questions on chat [64].

Even though mobile messaging apps, particularly WhatsApp, present many benefits in hospital settings, there are organisational concerns around using chat in healthcare, such as privacy of data, difficulty of auditing, and general inability to regulate the information sent [86]. This has led to a proliferation of official chat apps for clinicians' phones, offering features such as automated wiping of data or integration of chat with patient records [86]. However, most of these apps have low adoption or remain at the pilot stage [86].

There is a paucity of work on the use of mobile messaging apps by employees other than physicians. Dorwal et al. introduced WhatsApp groups into laboratory management [24]. Using a pre- and post-questionnaire to assess pros and cons of chat, they found that benefits like sending photographic evidence, critical alerts, and duty rosters outweighed issues like the additional burden of adding information to the app. Use among nurses specifically is understudied, despite their being integral to patient care and making up a significant portion of the hospital workforce. Yan introduced WeChat groups where nursing leadership and nurses could share training modules and lessons learned. A survey showed that this motivated nurses' enthusiasm for continued learning [96]. Bautista and Lin's interview study discusses broadly how nurses in Filipino hospitals use Facebook Messenger and Viber. They communicate with doctors and each other about patients, scheduling, and staffing, and use it for socializing and de-stressing [6].

In this paper, we examine chat use in nursing in the Global South. Compared to doctors who have been more commonly studied, nurses are lower in hierarchy, with less freedom of technology choice and use, and staff nurses were not allowed phones on shift. This enabled us to study the use of chat *for* work but not *at* work, and how hierarchy and power plays out in technology use. Further, we were able to examine how the resource constraints of the Global South, along with high patient volume, impacts technology adoption and use. Compared to trials of WhatsApp use, we also uncover why chat is adopted "organically", using in-depth ethnographic methods to examine how chat fits into nurses' work practices.

METHODS

The Fieldsite

We conducted an ethnographic study in Shraddha² Hospital, a 450-bed multi-specialty hospital. As is typical of hospitals in India, Shraddha is concerned with providing cost-effective, high quality healthcare to the maximum number of people. Shraddha serves a population with a wide range of incomes, so

²All names in this paper have been anonymized.

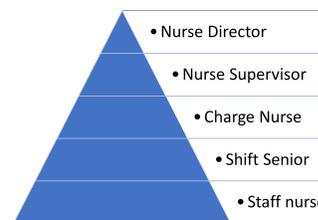


Figure 1: Nursing Hierarchy

accessible healthcare for the largest number of people means keeping costs low.

Shraddha is divided into wards of different types, including intensive care units (ICUs), the emergency ward, operation theaters, and general inpatient wards, which do not specialise by condition. Our study was conducted in these inpatient wards (known as "floors"). Patients, regardless of medical condition, are assigned beds according to the room type they desire, from open (in curtained off beds), to semi-private (two beds per room), to private. Wards with private rooms tended to serve more VIPs and patients from abroad, who are to be given particularly high-quality care. Each ward has one or two charge nurses, approximately 24 staff nurses working shifts, two doctors, a floor manager who takes care of operational issues, and a secretary. There are also other operational roles that provide services for multiple wards, such as housekeeping, transportation (who move patients), catering, IT, pharmacists, and dieticians.

The nursing hierarchy (Figure 1) consists of staff nurses and shift seniors who report to charge nurses, who report to nursing supervisors, of which there are three across the hospital. Nursing supervisors report to the nursing director, who oversees the entire hospital. Staff nurses work in three shifts, with six nurses in each: 8am-2pm (morning); 2pm-8pm (evening); 8pm-8am (night). At the end of each shift, outgoing nurses handover to incoming nurses, creating a one- to two-hour period of overlap between shifts. Where there is one charge nurse on the ward, they work 8am to 4pm; where there are two, they have overlapping shifts (8am-4pm and 12pm-8pm). Charge nurses are responsible for running their ward and managing staff nurses. Each shift has one shift senior who has additional responsibilities, including supervising staff nurses. Shifts of doctors, floor managers, pharmacists, and secretaries are from 9am to 5pm. Afterwards, the wards are served by night pharmacists, a medical emergency team, and two charge nurses supervising the hospital after hours.

Data Collection

Our ethnographic study consisted of five weeks of observations and in-situ interviews, primarily of nurses' work but also including admissions and two physiotherapists. These observations were supplemented by 15 interviews and three focus groups. We aimed to understand both the overall work practices of nurses and the role of chat in their work.

Observations were conducted in three visits over a five-month period. The observations were across four wards (VIP1, Semi-

Private1, Semi-Private2, and General) and the admissions department. We conducted semi-structured interviews with five charge nurses (two of whom were in a fifth ward we had not observed, VIP2), one shift senior, and three floor managers. In addition to understanding the work “on the ground”, to understand management’s perceptions of and goals for organisational communication and nurses’ work, we conducted interviews with four people in human resources (HR), the nursing director, the chief technology officer (CTO), and chief innovation officer (CIO). Finally, to probe deeper into chat use, we conducted focus groups: one group of 10 shift seniors, and two groups of five staff nurses and one shift senior. All authors made field visits, but the majority of the field work was conducted by the first author, who is fluent in both English and Telugu, the local language.

All the nurses were women and had a bachelor’s degree. Many staff nurses were from low- or middle-class families and planned to work at Shraddha for two years in order to find higher paying nursing work abroad. Most participants had mid-range Android smartphones and data packages of 1-1.5GB per day³. They reported using popular messaging and social media apps including WhatsApp, Facebook Messenger, Facebook, Instagram, and TikTok. WhatsApp was the main app used for work. Participants typically spoke English and Telugu, or other Indian languages, such as Malayalam. Hospital documents and systems were in English (as were all messages observed).

Data collected consisted of handwritten field notes, audio recordings, and photos of work-related artifacts, including chat messages. Field notes and audio recordings of interviews were written up, translated when needed, and shared within the research team. All data collected was either anonymized during collection or shortly after, removing any personally identifiable information. We gained permission at an organisational level to conduct the field study, and asked workers for permission as we came in contact with them during data collection. The majority of time was spent at the nurses’ station or the connected wings in which patients’ rooms were located. In the few instances when shadowing nurses included encountering patients, nurses explained our presence and got permission from the patients for the observation, but no patient data was recorded.

Data Analysis

Our analysis takes an ethnomethodologically-informed perspective. Ethnomethodologically-informed ethnography explicates the knowledgeable, artful ways in which participants organise their practice and reveals how technologies and other artifacts are used as part of the accomplishment of that practice [11,36]. Analysis was conducted individually and together, with a close reading of field notes (recording in detail the actions and interactions observed), the photos of chat messages, computer screens, anonymized patient files, nurses’ scratch paper, and handover notes. The aim was to understand what work a given message or note does in the unfolding situated practice. Immersion in the data through reading, writing, and

³As is common in India, where data is particularly cheap; \$2 per month for 1-1.5GB per day, plus unlimited calls and SMS.

discussing helped uncover gaps in understanding or new interesting phenomena that informed the next period of data collection, and resulted in the emergence of the themes around nurses’ work and chat use that form our findings. Example themes include the hierarchy of work, as well as the work accomplished through chat.

Self-disclosure

Our positionality shapes how we collect and analyze our data. The authors are researchers in HCI and come from the United States (of Indian origin), China, and the United Kingdom. The second and third authors reside in India. All authors are experienced in qualitative research, with the second and third authors having extensive ethnographic experience.

The study was initiated through a partnership between the researchers and Shraddha. Shraddha was chosen because it offered an opportunity to understand chat use in a hospital setting, aligning with our research interests. Shraddha wanted to understand why WhatsApp use was so widespread despite having official organisational communication tools. We shared our findings with the hospital after analysis.

The first author is originally from the city where the hospital is located and fluent in the local language. This allowed her to build rapport. During the observations, some staff were concerned that we were working for HR. In order to ensure workers were comfortable with our presence, we frequently explained which organisation we were working for and that the intent behind data collection was to understand technology use. We further explained that the data would be anonymized and only reported outside of the research team in a way that does not identify individual workers. We also gave workers the opportunity to look at the notes or pictures we were taking.

FINDINGS

Shraddha had two major communication needs: 1) for management to communicate to staff en-masse about organisational matters, and 2) for staff to communicate and coordinate across teams, departments, and shifts to enable coherent patient care. We explicate the role that WhatsApp played in the hospital. First we set the scene by introducing the technology ecosystem, and the characteristics of nurses’ work. We then describe the work done through chat. Finally, we turn to the nuances of using a personal tool at work from the perspective of both management and staff nurses.

Setting the Scene

The Technological Ecosystem

As is common to hospitals in many countries in the Global South, Shraddha uses a mixture of paper and digital systems to manage patient care. Patient information is primarily kept in paper files. The electronic patient record (EPR) system is mainly used for actions related to billing such as ordering drugs and lab tests. Nurses access the EPR through shared desktop computers at nurses’ stations.

In terms of communication, Shraddha is concerned with cost, confidentiality, and security, and this determines which tools are available to which workers. Only “executive level” employees (doctors, management, charge nurses, and above) have an

official email account. Staff-level workers (staff nurses, shift seniors, cleaners, etc.) do not, as the license for accounts includes not just email but a suite of office tools, such as spreadsheets and presentation software, which staff workers are unlikely to use, making the license too expensive for everyone. Concerns about patient confidentiality and data security play out in Shraddha's policies on mobile phone use. Staff-level workers are not allowed to use mobile phones on the floor to avoid distractions and data leakage, such as taking photos of patient records. Shift seniors, charge nurses, and executives (such as housekeeping managers) are allowed to use mobile phones. Each ward has landline phones and internal numbers.

WhatsApp was widely used in this ecosystem. Shraddha's management was aware of this and was not against the use of *chat* per se. However, WhatsApp use raised privacy and data security concerns around sensitive information being sent over a personal app. They wished to understand how they might migrate staff to an organisational chat tool: not necessarily to regulate or formalize chat use but rather to ensure that even informal communication respected patient privacy.

Being a Nurse

Nursing work consists broadly of care work, document work, and training and learning. Their day is determined by the rhythms of the ward and the organisation, but also by patients and their changing conditions, which are inherently unpredictable. Nurses' work is both *routine* and *unpredictable*, consisting of routine tasks that happen at a set time daily (e.g., handovers; taking vitals; giving medication, accompanying doctors' rounds) and tasks which may be common but ad hoc (e.g., attending to patient calls; assisting medical staff; transferring patients; dealing with emergencies). Nurses work with constant interruption and are constantly busy, but all tasks are not of equal importance. Nurses attend to a *hierarchy of work*, prioritising medical urgency and organisational hierarchy above routine tasks. Nurses are expected to provide support to medical staff, such as doctors, surgeons, and anesthesiologists, any of whom may drop by to see a patient. Nurses frequently must pause ongoing work such as documentation, which can be done later, to attend to more pressing, immediate needs. To illustrate, vitals checking and recording usually takes seven to nine minutes per patient, but during one observation it took a nurse 15 minutes per patient because of interruptions from patients' families, a cleaner, a charge nurse, a doctor, and another nurse who urgently needed the computer she was using to record the vitals.

There was a clear organisational concern with avoiding mistakes and we saw a tension between the practical work of nursing and the other work involved in being a nurse, such as documentation and learning and training. It is within this context that WhatsApp use needs to be understood.

Working with Chat

We first outline the chat groups observed before describing the work done through them. There were several *nursing groups* for management of wards and communication up and down the nursing hierarchy. Each ward had a "floor group", made up of the charge nurse(s), shift seniors, staff nurses, and

sometimes their nursing supervisor. Floor groups are the primary means of digital communication with staff nurses and their only work group, although some were members of social groups including all ward staff. As staff nurses are not permitted to bring their phones onto the floor, they must check this group when off-duty. Other nursing groups included: Shraddha Nursing, which consisted of the nursing director, nursing supervisors, charge nurses, and shift seniors; and Nursing Supervisor's Team which consisted of one nursing supervisor and her charge nurses and shift seniors. In addition, there were *cross-departmental management groups*, such as Shraddha Performance (CEO, doctors, nursing director, charge nurses, department heads, HR). Finally, there were groups to manage specific projects, as well as IT and Operations groups. Altogether, these groups served to support best practice, compliance and training, as well as reporting and prioritising patient satisfaction.

Best Practice, Compliance, and Training

Mistakes can impact patients' well-being and even cost lives. A clear organisational concern with ensuring compliance with processes and procedures permeated Shraddha from upper management to staff nurses. As one charge nurse shared, "*I don't want any issues in our floors, [...] even small or single issue also I don't want.*" Charge nurses consistently tried to ensure awareness of, and compliance with, best practice and procedure amongst their nurses. In person, they advise or even scold nurses on the job if they deviate from best practice. Chat is used to help ensure that a mistake is not repeated by other nurses. Charge nurses or shift seniors follow up any incident from which other nurses might learn with a post to the floor group. For instance, in Figure 2 (left), a charge nurse outlines best practice regarding labeling a lab sample, that is, not putting labels over the barcode. She illustrates the problem with an annotated image, accompanied by an explanation of how improper labeling impacts sample processing. The charge nurse expects at least some nurses to acknowledge, particularly shift seniors, who are supposed to reinforce the message in person with staff nurses. Additionally, incidents are written up in a counseling book at the nurses' station which staff nurses must sign. Chat messages instantly reach all nurses' phones, including those who are off-duty, and clearly document and detail the issue. However, they do not guarantee understanding in the same way as in-person discussion.

Chat supports *continuity of management* despite shift work. For example, one charge nurse had her shift senior send her pictures of the ward every evening after her shift had finished, to show that the ward was clean. This both serves to ensure that the ward gets adequately cleaned, even though an in-person check was not possible, and to let the charge nurse know that it is in order. Chat is also used to follow up with individual nurses, in the case of problems, even after their shift has finished. For example, as part of a new initiative in one ward, vitals needed to be entered into the EPR rather than the paper file. However, nurses were doing this late and inconsistently. The charge nurse followed up each inconsistency with the responsible nurse via the floor group. In Figure 2 (right), the charge nurse points out that one staff nurse has not entered the 10am vitals for a patient. The nurse explains she entered it at

11am because she had to move the patient and had explained the same to another senior nurse. Chat enabled charge nurses to monitor the ward when off-shift and manage her entire team whatever their shifts. Through chat, she can question all nurses and, whilst she might not get an answer immediately, it enables her to get more rapid responses and better manage her own work.

Finally, chat was used to support training, distributing documentation such as updates in processes and procedures, and informing nurses of upcoming classes that they need to attend. In one example, an infection control nurse borrowed the charge nurse's phone to send study materials for the nurses to read for a test the next day.

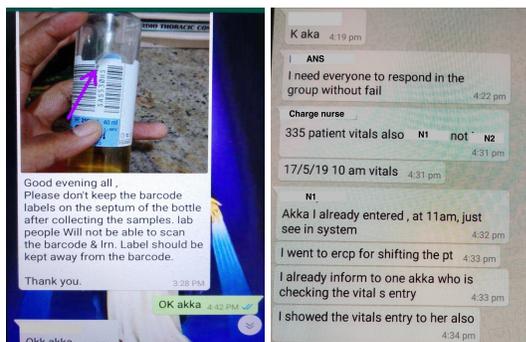


Figure 2: Left: Best practice on floor group; Right: Compliance on floor group

Reporting

Another way of supporting continuity between shifts was chat-based reporting. At the end of every shift, a report is created, detailing figures such as the number of patients admitted or discharged, critical patients, and any issues that arose. When the charge nurse is not there - at the end of the evening and night shifts, or when she is on leave - this report is shared through chat. Typically, it is typed out but may be hand-written and photographed. For example, the evening report is sent by shift seniors before they leave. The shift senior asks each staff nurse in turn for the bed numbers of admitted, discharged, and critical patients. She notes this on scratch paper, collates it, and types up a WhatsApp message summarizing it (Figure 3). She mentions a patient waiting on billing, indicating an upcoming discharge, and describes in detail how an issue with cannulization played out on-shift, taking care to mention that she has informed the night supervisors so that the charge nurse knows they are accountable.

Reporting over chat enables the charge nurse to keep an eye on what is happening on the ward whilst not present and serves to hold the nurses and shift senior accountable for following the correct procedure when issues arise. Whilst not on duty, the charge nurse is still in charge and ultimately responsible for what happens on her ward. Keeping abreast of ongoing work and incidents helps her when she returns to her shift, as she needs to be knowledgeable about each patient's status in morning rounds and demonstrate that she is monitoring the

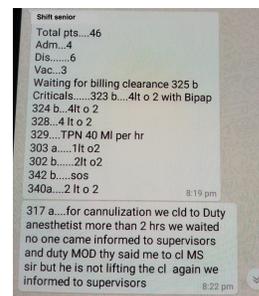


Figure 3: Shift report from floor group

ward. Charge nurses similarly report to the nursing supervisor via chat if they cannot do so in person.

Despite the usefulness of reports, using chat for reporting was time consuming. Reports require a mix of numbers and letters, which meant constantly switching keyboards, and medical terms were rarely part of the keyboard word suggestions, meaning typing a report could easily take 15 minutes.

Being Patient-Focused

As well as attending to patient's medical wellbeing, nurses must also care for emotional wellbeing. If a patient has a special event such as a birthday, the team celebrates with the patient. Pictures of these celebrations are shared on the floor group for morale, and on management groups as demonstration of a good ward. As one charge nurse said *"If we are having good rapport with patients, then only we'll come to know their birthdays and anniversaries and all, then only we can celebrate."*

The hospital management has a strong orientation to patient satisfaction and wards are evaluated on it. Patients can provide (formal) feedback in the form of compliments or complaints which are emailed to the nursing supervisor, who shares them through chat on Nursing Supervisor's Team. There, charge nurses and shift seniors can see feedback across wards, as well as their own. Charge nurses then forward feedback specific to their ward to their floor group, so that staff nurses can see it. Compliments that name individual nurses allow for recognition, whilst complaints offer a learning opportunity, reinforced offline with individual nurses. Patient satisfaction is also recorded in the Net Promoter Score (NPS), a ward-level performance metric. Scores are posted weekly on Shraddha Performance, letting the management know how each ward is doing. We saw messages in different chat groups orienting all nurses to doing the right things to get good scores. Thus, chat supports both a hospital-wide awareness of ward performance, and ward-level learning. The email-chat transition enables both group awareness and feeding back to nurses.

Situating Personal Chat Tools in Organisational Matters

In this section we examine chat use as an organisational phenomenon and the tensions its use creates.

Chat and the Nursing Hierarchy

The formality of nurses' chat use was striking. The groups created reflected the organisational hierarchy, influencing who

posts, what is posted, and group formation. When new staff nurses join, they are added to their floor group almost immediately. They rarely post except with “*Ok akka [older sister]*” (see Figure 2, left) to acknowledge they have read something, to give an explanation if called on to do so, or to provide requested information, such as uniform size. The only spontaneous posts we saw were to ask for the duty roster, showing their shifts. Whilst charge nurses are active posters in the floor group, which they use to manage their ward, they are less active in the nurse management groups, where they are lower in the hierarchy and it is usually the nursing supervisors who post on behalf of the nursing director. Even deciding what is posted is formal: as one charge nurse said, the nursing supervisors will ask the nursing director, and “*then madam will decide to please put it in the group so that everybody will be aware of the issue.*”

Information cascades down the hierarchy, through the chat groups. In one instance, the nursing director messaged the nursing supervisor about a new changing room. The nursing supervisor posted it on Shradha Nursing, from which the shift senior forwarded it to the floor group. Similarly, one shift senior explained how her charge nurse might send messages in a group with only shift seniors: “*First she will teach us, she will keep information with us, then we have to tell to our juniors.*” The shift seniors would then share in the floor group and follow up in-person with the staff nurses during their shift. When we asked the staff nurses how they identified which information was important in their floor groups, they replied, “*Every information if the [charge nurse] pass it, it will be important <laughs>.*” WhatsApp use reflects and reinforces the official hierarchy. Whilst it may not be officially sanctioned, it is neither informal nor ad hoc, instead being ordered and organised by the hospital structure.

However, this does not mean there was no flexibility. Which workers are included in a given group depends on that group’s manager. For example, whilst the floor groups of one charge nurse only contained nursing staff and the nursing supervisor, those of another also contained floor doctors and floor managers. Similarly, some charge nurses had groups with just them and their shift seniors, whilst others preferred to use the floor groups for all ward-level communication.

Using Personal Chat Tools for Work

Chat’s widespread adoption testifies to its usefulness in the hospital, but it was not without problems. One problem, reported previously, is the “chat data deluge” [59] consisting of the sheer volume of messages taking up space on personal phones. When charge nurses post, staff nurses acknowledge, resulting in “*oh so many messages*” (shift senior). Participants reported that they frequently deleted messages to free up space.

Chat could also be a distraction. One charge nurse noted how it detracted from her first priority, patient care:

“I don’t like using my phone. We are spending more time in WhatsApp so we are not able to know what is going in the wards that we run. Because in this floor, 40 beds is there, so 40 patients. Criticals is there, nurse

is there, she went to shifting other patient, so that wing nobody is there. If I’m not worrying about that wing, if I’m bothering about phone means [...] the patients can suffer, no? Most of the times, I’ll be [looking at] the important messages.”

Other charge nurses reported how they would mute groups, to reduce distraction from frequent notifications. Charge nurses also try to minimize the use of chat off-duty, despite their desire to stay in touch with their ward. One charge nurse mentioned “*Once I go home I’ll just keep my mobile away from me, I’ll see that when it rings only [...] apart from that I’m never using [...] I’ll just check for reporting purpose.*” In this quote, we can feel something of the intrusion of work on personal tools. One shift senior hints at attempts to separate work and home, saying “*Once the shift over, before we leave hospital, we’ll send [a report to the charge nurse].*” However, staff nurses are expected to read their messages off-shift, and they say “*We’ll make sure that we read everything.*”. Implying that the *opportunity* to separate work from life only comes as one moves up the hierarchy, but that personal tools do not easily *afford* such a separation even then.

Staff nurses did not express strong opinions about using their personal phones for work or checking messages off-shift (perhaps because they were not comfortable discussing it with us, had little choice in the first place, or had not really considered it). However, when asked if they would like a work phone, they were generally positive, as it would help them separate the “too many” work messages from personal messages. They also said that with this separation, if they were allowed a phone on-shift, they would not get distracted by personal messages nor be questioned about whether they are focused on work. They were not particularly enthusiastic about having a mobile phone on-shift in the first place, however.

The Unofficial Nature of Chat

Since staff-level workers at Shradha do not have organisational email accounts, the use of chat leaves the organisation with something of a dilemma. Chat supplements formal channels, enabling group awareness, visual illustrations of problems, and sharing information across shifts. However, the unofficial status of chat, combined with the fact that staff are not allowed to use smartphones on the floor, mean that HR has an uneasy relationship with it. HR employees have their own chat groups and post on management groups, but do not use chat to communicate with staff nurses. When they need to communicate with nurses to, say, advertise new benefits or instigate performance appraisals, they put up notices near the clocking-in machines, hold town-hall meetings, or phone campaigns (for remote clinics). However, these strategies are less than ideal, with one HR manager reporting that it takes a minimum of three to four weeks to reach people and even then, some will be missed. Notably, when asked, the nurses said they never read HR’s notices, except when charge nurses share on the floor group! As a staff nurse explained: “*One paper notice they will keep and our in-charge, she will [...] keep a photo in the WhatsApp group.*” Similarly, HR may email management who then use chat to spread the word. For example, to get sizes for new nurses’ uniforms, HR emailed

the nursing director, who sent the request on chat to charge nurses, who used floor groups to collect this information. In the end, despite HR's uneasiness, most communication from HR reached workers through chat.

Making Chat an Organisational Tool

Nurses had little idea about the potential privacy issues around having work information on personal phones. Whilst charge nurses did not take pictures of patient records or such data, this is still a concern for the organisation, and indeed would be a major driver for Shraddha to move to an official chat tool. However, making chat official might introduce new problems, at least for some more senior groups. Our interviewees from HR, who themselves used chat, felt that any formalization of chat would ruin a good thing. Chat was valued precisely because they saw it as informal, and they could quickly accomplish a simple task without the rules or ceremony that might be introduced otherwise. However, it is questionable whether the same holds for staff nurses who already experience chat as formal. In fact, workers lower in the hierarchy said they would be fine using an organisationally sanctioned chat app, saying “*new things we learn everyday no?*” and tellingly, “*telling means we have to do it.*”

It is important to highlight nurse's own notions of ownership and privacy. Less senior members, such as staff nurses in floor groups, or shift seniors and junior charge nurses in Shraddha Nursing, did not always feel they had the authority to show us the group's content. When nurses were more senior *in a group*, they felt comfortable showing us the messages. There was also a desire to keep some chats private. In one instance, a charge nurse asked us if we were with HR before mentioning a group that she was in which coordinated with another department to handle issues with a ward initiative, suggesting that those issues may not be apparent to the wider organisation.

Finally, privacy was desired in floor groups. Staff nurses were hesitant to show us messages where charge nurses were scolding them, pointing to the internal nature of the floor groups and how they are meant to correct behavior before it affects anything else. A staff nurse in the second focus group mentioned that privacy from non-nursing staff is why she would not want to receive messages on-shift through shared computers, unless it was protected by nurses' log-ins. This is in contrast to the management groups where we saw IT and maintenance issues being escalated in front of leadership as a way to get a resolution when traditional channels were not working. Typically, once an issue was raised in these groups, a response came within minutes.

DISCUSSION

We examined the formal and systematic use of chat in Shraddha. Our findings contribute to the growing body of research on the organisational use of chat. In this section, we examine which features of chat have led to such widespread adoption, and explicate the tensions between the personal and organisational. In particular, we describe how *workplace expectations* of use arise, and their impact on workers' personal choices. We also bring attention to workers lower in the hierarchy compared to physicians, who are more frequently researched.

Making Chat at Home in the Hospital

Chat was made at home in the hospital in two ways, as a tool within the larger communication ecosystem, and as a reflection of the hospital hierarchy.

Filling a Lacuna among Workplace Tools

Hospital work follows particular temporal and spatial rhythms, with staff on the move across the hospital or within wards and working shifts to provide round-the-clock care, whilst management work office hours or curtailed shifts. It is the combination of chat's features that make it such a useful tool in this setting. As noted elsewhere (e.g., [34, 37, 59, 63]), chat offers the ability to share short text messages and photos, create groups, and support both synchronous and asynchronous communication [34], and of course, chat is “to hand” *for staff who are allowed to use their phones on the floor*. We observed multiple types of communication within the groups: one-to-many announcements; many-to-one for data collection; many-to-many for social messages; and even (rather public) one-to-ones where charge nurses followed up with individual staff nurses in the group so that others could learn. Chat was used alongside a range of other communication tools and practices, such as meetings, phone calls, counseling books, posters, and email (for management). Frequently, multiple channels were used for the same message, to ensure understanding. Chat helps to reinforce messages about organisational and local work practices, detailing them with photos and enabling a rapid spread across shift boundaries. Despite being a personal tool on personal phones it has been “*made at home*” [71] in the hospital's communication ecosystem. It is used all the way from upper management to staff nurses, enabling management to keep communication digital by transitioning from email to chat. Indeed chat was *preferred* in that the transition happened at a high hierarchical level, rather than only occurring at the point where nurses did not have email. It was also used to go from physical to digital when taking photos of posters to ensure the message was conveyed. The value of photos has been noted elsewhere [45], and using them to bridge the physical and digital worlds is a core advantage of chat.

Chat was used for reporting, training and compliance, supporting best practice, and creating awareness. As in prior work [63], chat is used to set up meetings, but we also found that chat groups were created in and for continuing meetings. With multiple admins, it is possible to add the appropriate people in a decentralized way and at any time. Chat offered an easy way to rapidly spread awareness of relevant information through different strata of the hospital extending the town halls, shift meetings, in-person reporting, and process and policy reviews. In this way, chat supports the organisational concern with getting things right. It adds extra functionality to the set of resources for ensuring good practice, from photos, whether to prompt work or reveal learning opportunities (similar to [96]), to the ability for charge nurses to stay in touch through reporting when off-shift. Accountability was also practiced in various ways through chat, from calling nurses to account, to reporting, to taking photos of the clean ward.

Reinforcing the Hospital Hierarchy

Prior work on clinical teams with senior and junior doctors found that chat helps to flatten the hierarchy and ease com-

munication [44, 57, 67]. In Shraddha, WhatsApp use *reflects* and *reinforces* the hierarchy, through group membership, who posts what, who acknowledges what, and the hierarchy of groups. For example, staff nurses mainly post “*Ok akka*”, whilst Shraddha Nursing is for top-down communication from upper management. Shraddha has a formal, traditional hierarchy with staff nurses accountable to charge nurses and charge nurses to their nursing supervisor. This accountability manifested in various ways: staff nurses are directly scolded for mistakes, and the very presence of senior leadership in management groups was enough to ensure a rapid response from the relevant teams to issues raised on chat. The group visibility and membership makes chat an effective accountability device. Thus, communication practices such as being respectful or hesitant to interrupt a superior, do not disappear on chat but continue to manifest in various ways. It is not the communication tool *itself* (whether chat or any other tool) that determines what communication will look like, rather it is *the situated practices of using that tool*. Communication over chat can be just as hierarchical and formal as over any other means.

A particularly interesting example of hierarchy at work is in the hospitals’ information flows. Whilst prior work has largely looked at individual conversations or groups and the coordination that happens within them [46], by examining *the network of chat* we can see how the flow of information through the various chat groups supports the organisation in using the same information in different ways towards common goals. For example, NPS scores, audit results, and policy reminders flow through multiple chat groups, gaining particular, situated meaning and purpose when they are posted in Shraddha Performance (cross-departmental management group) versus Shraddha Nursing (nursing management group) versus floor groups. The first two support organisational management functions, the third is about operations and getting the work done on the ground. This group structure resolves some of the issues with chat seen in prior work where a lack of filtering made it difficult for workers to tell what information was relevant to them [59]. Creating groups along a hierarchy builds in filtering, so a staff nurse will know that if a charge nurse forwards something to the floor group, it is relevant to them.

Using Personal Tools for Work

Because of its widespread adoption and positioning within a hierarchical structure, there were also tensions around bringing a personal chat tool into work, complicating the notion of worker-driven adoption and the separation of work and personal time.

Worker-driven Adoption

Prior work in HCI on the use of personal tools among workers has largely studied *individual* perception and adoption [21, 42, 43, 75]. They show the creative ways such tools were used, sometimes to blur the lines between work and personal (such as checking personal email) or to get around workplace restrictions (such as using applications of choice to get work done). In Shraddha, in comparison, we examined the *organisational context* of WhatsApp use. Whilst it might seem that the adoption of WhatsApp was worker-driven, what does

“worker-driven” mean here? Certainly, it was not organisationally sanctioned and is not an official communication tool. However, its use in nursing is so prevalent and formal that it is being used *as though it were* an organisational tool. That nurses have smartphones and data is taken as a given (and we found no exceptions). Critical information is communicated over chat, and they have little choice but to be part of the chat ecosystem. None of the nurses we spoke to objected to this nor really discussed it. Nonetheless, it adds a different tint to the idea of chat adoption as worker-driven, especially as nurses said that if they were told to use a different organisational chat app, they would simply have to do it. It is clear that WhatsApp, as a mobile phone-based chat app, supported the work of the hospital, but once it was endemic, *individual workers* have little choice but to use it. This collective effect, which capitalizes on widespread personal adoption and results in new expectations for use, is rather different from previous research which looked at how *individual professionals* and *knowledge workers* build and control their artifact ecologies [8, 9, 42, 43, 70, 75, 79, 89]. Whilst the idea of worker-driven adoption might seem equitable and democratic, it is complicated when such tools become *necessary* for that work. Further, it is worth reflecting on which workers have a say over adoption in the first place and how adoption impacts workers at different hierarchical levels, as we discuss next.

Taking Nursing Work Home

If chat is made at home in the hospital, it also takes the hospital home - a more uneasy relationship. This has been noted in passing in other research on chat in healthcare, such as consultants responding to questions outside of work [64], but is worth examining more closely. Since staff nurses cannot use their phones on-shift, they *necessarily* have to keep up with the chat after work. Further, since messages are often about tasks that need to be done before the next shift, such as looking over training materials or showing up to a training session, nurses were obligated to check these messages not just “at some point” but sooner rather than later. This raises questions around when staff nurses are not on call in some way, or when they can be sure they do not need to check work-related messages. However, even if phones were allowed on-shift, work would still carry off-shift, in part because one of the most useful aspects of chat for charge nurses and others is bridging the temporal mismatches between shift work and management work. It is also a consequence of an *essential tension* in nurses’ work between the *doing of nursing* - a physical, hands-on job, that is busy, sometimes urgent, and frequently interrupted - and all the other work necessary to *being a nurse*. This includes training, continual learning, reporting, and being accountable, all of which are supported by chat. Reading of training documents and absorbing new material requires focus and concentration and could not easily be done on-shift because the rhythm of work does not support focus time. Whilst there are formal structures for training, such as classes before shifts, much of the training is more ad hoc. With chat, this ad hoc training infiltrates off-shift. Even picking up best practices, which in theory might be done on-shift, in practice could be difficult. Such work is currently largely *invisible work* [77].

Staff nurses did not particularly want to look at messages during their shift. This is in part, as noted elsewhere [23], due to concerns about being called up for doing personal tasks at work, but also because of the problems of fitting message reading in with their ongoing nursing work. They already struggle with the tension between caring for patients and documenting this care, and we have seen how charge nurses struggled to balance being present on the ward with being present in chat. As noted elsewhere [66], messaging on-shift whilst useful can be disruptive, but is a reasonable consequence of that to expect staff nurses to take it off-shift?

These findings contribute to understandings of work-life balance in different domains and expand on studies of using personal phones in healthcare settings [23, 58, 64, 74]. Whilst previous studies highlighted the impact on-shift, in terms of distraction and appearing unprofessional, they do not consider the impact off-shift, although some mention in passing that work can extend past the workplace [64]. Further, these studies observe greater autonomy in whether and how *individual workers* like physicians use these tools, but in Shradha's case, WhatsApp became an *organisationally necessary* tool. This makes the infiltration of work into personal time when personal apps and devices are used more explicit and visible. Other research examined freelance, nomadic, and knowledge workers [14, 16, 20, 21, 25, 30, 32, 72, 78]. They emphasized the ways individuals navigate work-life balance and structure their time, focusing on how they actively set, soften, or dissolve boundaries as needed (allowing work-into-life and life-into-work), or set micro-boundaries [14, 16]. However, staff nurses had much less freedom. Given WhatsApp brings work messages alongside personal messages, micro-boundaries [14, 16] are difficult. Further, whilst management-level nurses could put their phone aside, a less than ideal solution already, it is not clear that staff nurses even have such freedom. In comparison, professionals, doctors, and managers may have more control over these boundaries.

The Organisational Dilemma

From an organisational perspective, chat use introduces an interesting dilemma. It is widely and systematically used and is clearly organisationally useful. WhatsApp use however poses known concerns about data privacy and confidentiality [86]. An obvious solution would be to introduce an organisational chat tool which takes care of data concerns. However, introducing such a tool is not quite so simple. First, given the price consciousness of the hospital, it is extremely unlikely they could buy work phones for all levels of staff. Thus, it would need to be an organisational tool on a personal device, which raises its own questions, from the data deluge, to organisational mandate. Second, the activity on chat necessarily becomes sanctioned by, and visible to, the organisation. As staff nurses are not allowed to use their phones at work according to HR policies, the hospital would be asking nurses to work off-shift. Since chat has been adopted and is being used as though it were an organisational tool, making this invisible work [77] visible and organisationally acknowledging it would be no bad thing but it does introduce new issues. It is in the move to formalize chat that invisible work becomes visible, whereas when carried out on a personal app on a personal

device, it remains largely invisible. These findings have implications beyond Shradha, given that personal tools are likely to be increasingly used in the workplace. How can organisations understand and take into account the work done on such tools and the burdens and opportunities they bring to the workplace and workers? At the moment, chat, for example, sits in something of a gray area, as noted previously [85].

Finally, it is many of the informal features of chat that make it so useful, such as being able to create any groups you want or to be able to communicate without upper management monitoring it. Any formalization of chat through an organisational tool would need to be carefully considered. As noted in [59], the tendency for organisational tools to be implemented top-down can detract from their usefulness and uptake. This highlights another organisational tension: workers' need for informal communication versus the organisations' desire to control and monitor communication. Whilst we recognize and, in theory, support the call for greater freedom in technology use in the workplace [73], it is also vital that we get a clearer understanding of the implications of the widespread adoption of personal tools such as chat in organisations, looking beyond professionals and knowledge workers. How can organisations and workers manage the encroachment into personal time? This is especially important to consider for those lower in the hierarchy and in, for example, caring professions where work can bleed into the personal for all sorts of reasons.

CONCLUSION

In describing the use of chat in nurses' work, we drew attention to a number of ways chat is made at home in the hospital. A notable difference between our research and most previous research into chat ([7, 35, 59] being notable exceptions) is that by taking an ethnographic approach and examining closely how chat is embedded in the *ongoing work of the organisation*, we explicate how chat is used to accomplish that work and the consequences of its use for workers. We complicated the idea of worker-driven adoption, by showing how WhatsApp is used as though it were an organisational tool. By examining how chat bridges the spatial and temporal rhythms of nurses' work, we highlight the tension between doing nursing and the other work of being a nurse, and how chat brings the hospital home. Interestingly, if chat were to be made an organisational tool, this invisible work would be made visible in the organisation. As the use of chat and other personal tools increases in organisations, this has implications beyond knowledge workers and professionals in the Global North. We must also understand the impacts on hourly and care workers (such as nurses), whose work is often of a different nature and must be recognized, whether it is physical or digital.

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