The Collaborative work of Hospital Porters: Accountability, Visibility and Configurations of Work

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ABSTRACT

In this paper, we describe the collaborative work of hospital porters. The profession of hospital porters is understudied in sociology and in Computer Supported Cooperative Work, despite numerous studies of healthcare IT. We describe how a new IT system for hospital logistics provided porters with more influence on, and responsibility for their work; supported collaboration among porters, clinicians, and middle management; and effected a new ecology of visibility and accountability of porters’ work. We discuss how the new system simultaneously supported collaboration and generated representations and accounts of porters’ work. We compare the particular work arrangement in this study with other studies of porters’ work, show the widely different configurations of how IT and work can be organized, and argue for the benefit of making comparative studies within CSCW. Finally, we argue for moving beyond dualisms of coordination and accountability for work.

Author Keywords

Accountability; cooperative work; CSCW; healthcare IT; hospital orderlies; hospital porters; hospital logistics; task management; visibility.

ACM Classification Keywords

H.5.m. Information interfaces and presentation: Miscellaneous.

INTRODUCTION

In the last decades, huge investments have been made in the design, development, and introduction of IT for healthcare. Much attention has been given to electronic patient records (EPR) in an effort to increase the quality of care, support coordination of healthcare services, and cooperation across settings [8, 10]. However, efforts have also been invested in supporting cooperation and awareness on wards, through large, shared whiteboards [5, 55]; supporting coordination across departments [4, 25]; and in supporting team work in emergency departments [9, 32] (for an overview of this in CSCW see [21]). However, despite these diverse efforts, the primary focus of investments and in research has been on the two largest and most prominent professions: physicians and nurses. Non-clinicians in healthcare have received little attention, but this will most likely change, as the digitization of healthcare develops in depth and scope. Here, CSCW may contribute to the adequate development of IT and transformation of non-clinicians’ work.

In this paper, we describe the work of hospital porters, a low-wage profession at the lowest end of the hospital hierarchy. Porters have received little attention in academia and in strategies for IT in healthcare. Based on the implementation of an IT system to support hospital logistics by tracking artifacts, equipment, expensive medicine, transports, and hospital porters, we describe the changes in the collaborative work of hospital porters, and the new possibilities and challenges that arose. The new IT system enabled better coordination of porters’ work, provided porters with more influence on their everyday work, and made porters, as well as their tasks, visible and subject to new forms of accountability. Hence, the system both supported cooperation and functioned as an accountability system. We discuss the asymmetrical visibilities and accountabilities that the new system affected, and point out the possible ways in which porters’ collaborative work may develop, depending on how IT has been designed, implemented, and appropriated. We argue that IT and work can be configured in widely different ways by comparing this case with other studies of porters’ work, and argue for the benefit of comparative studies. Finally, we argue for moving beyond the dualism of coordination and accountability, since these are interrelated and can generate various outcomes.

RELATED WORK: HEALTHCARE IT AND PORTERS

The digitization of healthcare gained momentum in the early 1990s, with investments in the development of EPRs, especially for physicians and nurses, the two largest and strongest professions within the domain. However, as the processes of digitization expand in scope and depth, they will most likely involve and affect other professions as well [11, 51]. Hospital work is also dependent on a wide range of non-clinical professions when providing care and treatment including medical secretaries, laboratory assistants, registration assistants, social workers, kitchen staff, and porters [47]. If not already digitized, their work
will most likely become so within the coming years. Presently, there are only few studies describing the work of non-clinical groups in healthcare, and there is a dearth of studies of hospital porters.

Non-clinicians have been investigated in a small number of studies within CSCW or related fields. Tang et al. point out the importance of social workers, porters, insurance company representatives, and staff in hospital external facilities, for the efficiency of outpatient flow at a hospital’s emergency department. They describe the coordination of patient outflow as primarily non-clinical, invisible, and unsupported by IT [51]. Abraham and Reddy describe the role of non-clinical staff, and the coordination of intra- and inter-departmental patient transfers [1, 2]. Further, Bossen et al. describe medical secretaries’ work, and how it changed when an EPR was implemented [11]. Finally, Murphy et al. point out the importance of social workers, registration assistants, and care coordinators in coordinating patient care processes: However, the these non-clinicians, could not edit incorrect information or send messages in their EPR, which led to inefficient care processes [27].

Hospital porters (or orderlies) have received little academic attention at all. Even a broad search resulted in only 13 studies of relevance to this paper. These may be put into three groups. Additionally, 12 studies were found that somehow include porters, bringing the total to 25 papers.

A group of three studies focuses on the life and work of porters as a subject in its own right. Saunders (1979) contrasts the public image of porters as merely unskilled, poorly paid, and work-for-money, with the actuality that they take pride in their work, and see themselves as nurses’ aides, boosters of patient morale, and are generally concerned with care [40]. Rapport (2008, 2009) provides the most in-depth study of porters across all groups. Based on ten months of anthropological fieldwork at a Scottish hospital, he describes porters’ negotiation of power, invisibility, and identity [36] [37]: “Being a porter meant coming to terms with being a nothing, at the base of a hospital hierarchy topped by doctors” [37: p59]. Of note, Strauss et al. (1985), in their classic study of various kinds hospital work, also include “transport people,” who move patients, dead bodies, equipment, and samples [47: p54-55].

A second group of six studies focuses on making portering services effective, either in cases of hospital reorganization, or quality improvement projects. Dershin and Shaik (1992) engaged in a quality improvement project, re-organized patient transport, and reduced patient waiting times by introducing two-way radio communication between a central dispatcher and porters, optimizing staffing, and reducing extra work due to insufficient information about the transports [17]. Similarly, Sullivan and Fretzel (1992) focus on porter services in the process of arguing for a method for executing quality improvement projects [50]. Bryan (1998) describes efforts to improve porter services after the merger of two hospitals, through a computerized dispatch system and scheduling of recurrent porter tasks [15]. Lin (1999) developed a computer-based heuristic algorithm for scheduling the monthly roster of porters at a major hospital in Hong Kong [26]. Chow-Chu and Goh (2000) argue for the importance of portering services to the overall performance of hospitals, and pursued lower response times – for example, from when a request is made, until the porter arrives at the site – by minimizing waiting times at elevators, training cleaners as additional porter staff for peak periods, and pooling all porters, instead assigning them to specific departments [16]. Odegaard et al. (2007) provide a comprehensive study of porters second only to Rapport’s. Based on a seven-month, mixed-method study, they aimed to make portering services and the hospital’s overall performance more effective, and identified two major challenges: communication, and scheduling staff according to demand. Inefficient communication between dispatcher, departments, and porters meant longer dispatch times and pick-up times, and staff scheduling did not adequately take known peak hours into consideration [29] (also see [28]).

A third group of three studies focuses on porters’ work and IT. Xiao et al. (2010) analyzed how “transport cards” support formal and informal coordination of inpatient transport [54]. Torkilshyeggi and Hertzum (2014) describe the usefulness of pilot IT implementations, and how to achieve user participation, based on a trial test of a system for coordinating patient transport between nurses and porters [52]. Stisen et al. (2014) investigated the potential of wearable devices for porters migrating to an electronic dispatch and positioning system [46].

A final pool of twelve studies that address porters covers various subjects: five studies address ergonomics and the physical strain of porters’ work; four papers address differences among healthcare professions, such as life expectancy and smoking habits; two studies of porters’ roles in during war time, and in Papua New Guinea hospitals; and a book chapter on low-wage jobs in the UK, including care assistants, cleaners, and porters (interested readers may obtain references from the first author).

Finally, it should be mentioned that patient transport and flow have been investigated through an engineering approach, applying queuing models, simulation, and patient flow project management tools. However, these have a predominantly operations management perspective, and rarely if ever mention porters or their work (See e.g. [23]).

In summary, porters are at the lowest end of the hospital hierarchy, and are relatively invisible there, and in the research. They mainly receive attention in connection with projects on quality improvement or organizational efficiency, and few studies display more than a passing interest in porters’ work per se [29, 37, 40, 52, 54]. Thus, as digitization of healthcare expands in scope and depth, there is a need to study hospital porters from a cooperative work perspective.
THEORY

The analysis in this paper is informed by the strand of symbolic interactionism focusing on work [45, 48], and its further development within healthcare [47] and CSCW [44, 42, 41]. One of the central aims of symbolic interactionism is to make visible the effort that goes into the interactions among actors, which tends to be overlooked or rendered insignificant by rationalistic accounts of action [48: chpt 1]. Hence, rather than assuming that cooperation takes place, the aim is to make visible how cooperation is achieved by actors’ monitoring, reflection on, and alignment of their actions, depending on whether the accumulation of interactions points to desired goals [ibid]. We briefly outline some of the central concepts of our analysis.

Since cooperation is an achievement, an initial focus is on how individual actors’ stances and acts are aligned to contribute to the cooperative goals. Then, efforts at articulation work may be made to coordinate tasks and subtasks, which actors to involve and when, equipment, and so on. Alignment and articulation work is often reduced, as routines, divisions of work, and standard operating procedures (SOP) emerge, and will often be minimal – and hence unnoticed – as long as interactions develop along recurrent patterns and trajectories. Articulation work may be invested in working out arrangements that agree on who does what, when, by which means, according to which standards, and so on. [48] [47]. SOPs and arrangements may be inscribed as protocols for action on different materials, such as paper or IT systems, or artifacts, and hence as coordination mechanisms, achieve a more stable existence over time and space [41: p165-166]. While coordination mechanisms may be understood more broadly as any material or immaterial way of coordinating work (e.g. [30]), here we employ it in the above more specific sense as a combination of a protocol and an artifact. An important factor in the ongoing alignment and coordination of work is awareness, with which actors display their own acts and monitor others’ acts, and thus recursively adjust to how work processes unfold [24, 44].

Since cooperative work is most often distributed, the challenges of coordination and communication are greatly augmented. Aligning and articulating work and arriving at and keeping up arrangements are more cumbersome when not done collocated, and the need for communication and stabilization of routines and arrangements is stronger, and most often solved through coordination mechanism. This pertains both to being aware of the status of the overall cooperative arrangement – the group of cooperating actors as constituted by their interdependent activities – as well as the common field of work – the interconnected processes, objects, and actors with which the cooperative arrangement interacts [42: p20].

Discovering, describing, analyzing, and making cooperative work visible are central to the design and development of IT systems, since otherwise, these are in danger of hindering, rather than supporting work, or becoming outright obsolete (e.g. [14]). However, making work visible entails challenges. What work is visible (or not), and whether this is beneficial or detrimental, depends on context, and is constantly negotiated. Star and Strauss propose four ways in which work may be invisible: by creating non-persons who are not noticed (e.g. domestic work); dis-embedding background work (e.g. nurses’ and secretaries’ work, which is taken for granted, and unnoticed); going backstage (e.g. dish-washing; janitorial work); and abstraction and indicator manipulation (e.g. visualizing work through graphs and tables) [45]. Being invisible in these ways is usually not an advantage for the actors with respect to status, salary, or rights. On the other hand, keeping work invisible may be a privilege that many managers and people in high positions maintain. Making work visible may entail having to account for one’s actions according to other peoples’ standards: hence, neither the CEO, nor the janitor may be happy to let the other look at their work schedules. As Star and Strauss caution: “…forced representation of work (especially that which results in computer support) may kill the very processes which are the target of support, by destroying naturally occurring information exchange, stories, and networks” [45: p24]. Since CSCW systems are often also “technologies of accountability” that represent and produce accounts of work, while at the same time enabling and supporting that work, the negotiation of (in)visibility is often a central concern, and usually within the context of asymmetric power relations [14, 49].

Generalizations should be made cautiously, but from the above section on related work, it seems that porters are invisible in several ways. They are not noticed, and become “non-persons”: Rapport summarized his fieldwork experience with “Being a porter meant dealing with being a nothing” [37: p57]. Porters also seem subject to processes of “dis-embedding background work,” since they mainly become visible in cases of “breaching situations,” where the normal hospital processes break down, or are inefficient: quality improvement projects [16, 17, 50]; hospital mergers [15], restructuring [16]; inefficient use of costly equipment, such as that in operating rooms, and CT and MR scanners [29]; and negative feedback from other departments [50]. Finally, porters’ work is presented through abstraction and indicators, since central factors of these quality and efficiency projects are performance measures and statistics through which porters’ work is planned and made accountable to managers [15, 17, 26, 29, 50]. However, as we argue, much depends on the actual ecology of (in)visibility and its asymmetries, which again depends on the way IT is designed and introduced, and on how work is reorganized.

SETTING AND METHODS

To become a porter in Denmark, one must pass a six-week course and work in that capacity for eight months, at the end of which one must complete a 20-day theory course.
However, the position of “hospital porter” is being revised, since some hospitals merge it with that of “cleaning assistant,” for a newer position of “hospital service assistant,” which includes cleaning, as well as portering services. This has met with some resistance, since most porters are men, some of whom do not want to clean, and most cleaners are women, some of whom find some porters’ tasks too physically demanding [20].

The university hospital where the current study was conducted has approximately 6,500 employees, 950 beds, and treats more than 550,000 outpatients per year. It consists of five geographically distributed sections, of which the research site – Section South – is the largest. The logistics department includes several units: one for sterilizing equipment, Internal Mail, The Chapel, and Porter Central. This last employs 114 porters, of which 4 are women, and a (male) dispatcher who takes care of the daily coordination of tasks, porters, and work schedules.

The Porter Central is located in the heart of the main building on the 1st floor, providing easy access to the basement corridors and the central elevator tower connecting the wards on 10 different floors. However, renovations and the addition of new buildings pose new challenges to the internal logistics. Until last year, porters worked in six teams allocated to specific departments, which have been pooled, and now cover the whole hospital. The logistics department has considered, but not yet implemented, the position of “hospital service assistant.”

The Task Management System
The Task Management System (TMS), newly developed by an IT vendor, is a scheduling system that aims to address the challenges of coordinating and streamlining porter tasks. Before TMS, clinicians at the hospital phoned in tasks to the dispatcher, who then contacted porters by radio or by telephone. A recurrent problem with information being passed on verbally was frequent misunderstandings between dispatcher, porters, and clinicians. Also, tasks were not always given to the closest, but to the first available porter. Combined with a constant, incoming stream of planned and ad-hoc tasks, this meant an inefficient workflow, long waiting times, and at worst, cancelled treatments and surgeries.

TMS aims to make scheduling, coordination, and execution of tasks visible to both porters and clinicians. Clinicians can request and prioritize porter tasks, and enter written comments, for instance, “Bring lift.” They can also follow the status of tasks (pending, booked, started) in a web-based desktop application available at the wards. At their end, porters can view and assign themselves the incoming tasks via smartphones. They can also keep themselves updated on colleagues’ tasks and locations, in order to coordinate work, since TMS tracks their positions in real-time via Wi-Fi. Moreover, a large, widescreen display in the porters’ common room shows an overview of all current tasks and their statuses, as well as of porters’ availability and locations. Thus, an overview of the total workload is provided to porters and the dispatcher.

TMS has been running as a pilot project at Section South since February 2013. During this test phase, the IT vendor developed new features, trying to elicit as much feedback as possible before introducing the system at other hospitals.

Data collection and processing
Data for this study was generated in two phases by the second author. In the first phase, the second author took part in the pilot project at Section South for six months as UX designer for the IT vendor. This involved visits to wards, usability tests with porters and clinicians, and meetings with the dispatcher and the logistics managers. The detailed knowledge gained during this period, regarding TMS, the organization of porters’ work, and Section South, informed the next phase.

In the second phase, the second author was no longer affiliated with the IT vendor, and conducted university-based, three-stage ethnographic fieldwork over a three-month period. First, 23 hours of focused participatory observation with nine different porters was conducted over five different days (varying among day, evening, and night shifts). Comprehensive and detailed field notes were taken during or shortly after each observation. During observation, the second author wore a porter’s uniform, had a smartphone running the TMS, and participated in porters’ work. Second, five different meetings were held with clinicians and mid-level-managers, with a common focus on sharing experience of the use of TMS to handle porter...
tasks. The meetings were arranged by the logistics managers, and the participants were internal hospital staff from various wards using the TMS. The second author was invited to participate because of his knowledge of the UX design of TMS, and as part of his research. Third, 12 open-ended interviews were conducted with porters, clinicians, the dispatcher, a union representative, and the managers of the logistics department (shortest 29 min; longest 53 min; average 36 min). The interviews supplemented and followed up on the findings from the observation and five meetings. All meetings and interviews were recorded and transcribed verbatim, and total 16 hours.

The second author’s dual role – as first a UX designer and then academic researcher – did provide a strong basis for the data collection, but at the same time entailed a certain ambiguity of his roles at the site. Sometimes, it was necessary to explicitly clarify this role and the interest in being in the field in order to clarify confusions or presumptions:

Back in common room two porters who I previously followed around the hospital during observations ask me why exactly I’m interested in hospital porters? They previously saw me chatting with the Head of Logistics and they might be unclear and a little sceptic about my intentions. I pointed out that my presence had nothing to do with them being measured or monitored, but strictly had a research purpose. (Field note, November 2014)

It is possible that the dual roles led to porters, management or the IT vendor to provide partial or biased information, but no such explicit situations were discovered. Moving between different context, the second author keen to act responsibly and not disclose information that might be sensitive. Further, in analysing the data effort was made to include all perspectives gathered and be aware of the various perspectives that data reflected.

The data underwent a preliminary processing and meaning condensation to explore the generated data and its analytical potential. Subsequently, the data was analyzed with the purpose of identifying common thematic characteristics. After thematizing the data, a more categorical process of coding and quantifying the findings were conducted, to narrow down categories, and to help set the scope of further analysis. This resulted in seven thematic codes: organizational change, task prioritization, coordination of work, situational overview, working environment, surveillance, and business intelligence. Subsequently, the analyzed data was worked into the analysis presented below, sensitized by the theories presented above.

**THE COLLABORATIVE WORK OF HOSPITAL PORTERS**

Since porters’ work is inherently distributed and mobile, communicating and coordinating tasks is challenging. At some hospitals, the work arrangement is based on multiple local teams of porters who communicate face-to-face with the clinicians. At other hospitals, porters’ work has been centralized, with a dispatcher coordinating tasks between clinicians and porters via pagers or phones. In the former case, cooperation and awareness are facilitated by co-location, whereas in the latter, a more elaborate work arrangement is required.

**Tasks, rhythms, spaces, and places**

Hospital porters have a variety of tasks, some of which involve patient contact, such as mobilizing patients (e.g. moving a patient from the bed to a wheelchair), patient transportation in beds or wheelchairs, and assisting other staff in cases of cardiac arrest or other kinds of trauma (e.g. patient falls to the floor). Other tasks include transport of debris, equipment, and beds to and from departments, examination or operating rooms, and the bed-cleaning unit.

Porter tasks inevitably involve moving around, whether the tasks involve mobilizing a patient in one place, or moving a patient or equipment from one department to another. However, some places are more central to the porters than others. This includes the Porter Central and the common room; the bed-cleaning unit and depot; the aids and utilities depot, conveniently next to the Emergency Department, since patients here often need a wheelchair or crutches; the reception desks at departments where porters have to announce their arrival; the elevator; and the goods lifts that are accessible only with an identity card. The latter two often become bottlenecks that cause delays for porters.

Although some tasks are recurrent and planned, many others are ad hoc. An overall daily rhythm is provided by a morning meeting at 7am on weekdays, and the day, afternoon and night shifts (7am-4pm; 4pm-midnight; midnight-7am). During the day shift, most porter tasks are
ad hoc, since the demand arises mainly in connection with patient care, examinations, and treatments, as physicians make their ward rounds and nurses provide care.

Although physicians and nurses have their own rhythms in the departments [38] [56], porters work across departments usually likely have different rhythms, which means that new task requests come without any pattern, except a peak around noon (see Table 1). Most tasks are typically scheduled during the afternoon and night shifts, for example, mobilizing (e.g. turning) patients at the intensive care units every 4 hours, to prevent bedsores, or moving cleaned beds to departments from the bed depot or cleaning unit. At all times, however, emergencies such as cardiac arrest may interrupt porters’ tasks.

Table 1. Workload during a representative day

On average, 35 porters take care of approximately 700 tasks every day. Staffing and workload are displayed in Table 1, below, based on data from the TMS from a representative day: 75% of all 726 tasks were handled during the day shift, which is also when most porters are present.

Overall, one might think that task unpredictability would stress porters, but instead, they see this as a motivator:

*It’s the variety that work can offer. You never know your work day. You think you do, but you don’t. It is different from day to day, which I highly appreciate.* (Male porter, 48 years)

Another motivating factor is the contact with patients:

*You meet a lot of nice people. Of course, also people in crisis, and then it’s great that you can be there for them, when they need it. And patients actually use us a lot, ’cause when a doctor arrives there’s only time to talk disease, since the doctor’s time is expensive. No small talk there. So instead, patients off-load a lot on us, which I actually appreciate hugely.* (Male porter, 34 years)

Both statements align with Saunders’ finding that “The variety of the work and its people-orientation holds … great attraction for many porters” [40: p31]. At the same time, among the almost exclusively male porters, the tone is straightforward, comparable to that of dock workers, but usually confined within the Porter Central.

In addition to contact with patients, porters also collaborate with one another. Obviously, this is the case with two-person assignments, for example, lifting a bedridden patient when changing sheets or a mattress, or moving patients from one bed to another. It also includes random meetings between porters in corridors, chatting, and helping each other out with locating places and equipment, for example.

Porters also have contact with other professions, most often the nurses who book porter tasks, must be notified when the porter arrives to pick up or deliver equipment or patients, and sometimes help porters with two-persons tasks. Although often cordial, this cooperation is at times strained, when equipment is missing, either because the nurse did not enter it when booking, or because the porter did not read the note. Or, when waiting times for porters lengthen, and slow departments’ processes, which stresses nurses.

Figure 5. Two porters wheeling a bed into an elevator

Porters’ work arrangements before the TMS

To understand the changes associated with the implementation of TMS, an outline of the cooperative arrangement of porters’ work before that is in place. Since it only serves to set the new work arrangement in context, and is based on retrospective accounts from interviews, the outline will be brief.

Previously, articulation and coordination of porter tasks were handled during the day shift by a central dispatcher, who would receive requests for a porter over the telephone, from the departments. Outside the day shift, calls were automatically forwarded to a phone chain, locating a random porter.

In order to coordinate and delegate portering tasks we used to have a dispatcher who worked full time answering calls from clinical wards needing portering services. The phone would normally ring 2-3 times every 5 minutes and the line was often very busy during the day shift. Outside day shifts and weekends the calls were forwarded to the porters via a phone chain (Head of logistics)

Receiving calls, the dispatcher would request necessary information about the task, such as place, time, type, necessary equipment or means of transport, and select a porter to do the task, based on his knowledge of the location and availability of various porters. To keep an overview, he used various artifacts: a staff schedule, a task list, small blocks with porters’ names on them, notes, and a division of his desktop into two zones: one for available porters, the other for porters on assignment. After receiving calls, the dispatcher wrote a task on the task list, and on a note that
stands out. (Male Porter, 34 years)

used to sounds from equipment in the rooms, but this croaking

departments. It makes it quite clear that we are present. They are

these small croaks from our pockets, when we were in the

This increased visibility was confirmed by a radiographer:

This increased visibility was confirmed by a radiographer:

I experience the porters differently now. They have become more
visible out here in the departments (Male Radiographer, 46 years)

TMS also reduced the number of misunderstandings or
duplicate work for porters, since the departments could
write requirements for equipment or means of transport into
the booking request. A medical secretary said:

It is great that the porter knows the task in advance and can see
the patient’s name, room number, where the patient should go,
and if there are any special needs. It makes it easier for me and

the porter when they arrive here. (Medical secretary, bed ward)

Similar sentiments were expressed by the porters:

It is cool that they [the clinicians] themselves note that I must
bring a lift sling, a wheelchair, or a lift. Before, when they phoned
in, they often forgot to tell us these details, which cost us
time. There are fewer misunderstandings now. (Male Porter, 34
years)

Another change was that, instead of being assigned tasks by the
dispatcher, porters accepted tasks on their own
initiative, based on priority, their location, and a general
overview of booked tasks and colleagues’ availability and
locations. They could actively use their judgment and
knowledge of how to best coordinate their tasks, and
contribute to the overall work processes. They gained
influence on, and responsibility for their work.

Previously, we would call the dispatcher when we had completed
a task, and he sat with all the tasks on a piece of paper and sent us
out. He assessed which task had highest priority, or what was
closest. We did not have any influence on that. With the new
system, I feel it’s less hectic. I know what I am doing now, what
the next task will be, and I can better plan two to three tasks
ahead. It has become more independent. (Male Porter, 48 years)

Increased awareness

TMS also meant changes to the awareness actors had of the
cooperative arrangement as well as of the common field of
work, since actions of clinicians and porters regarding tasks
could be displayed to and monitored by each other. As
mentioned, porters now had an overview of all tasks and
porters and their statuses, which was a significant change
from previously, when they only got new information from
the dispatcher, or from colleagues in the common room, or
from random encounters in the corridors. However,
establishing an overview was still somewhat of a challenge,
since the smartphone screens only allowed for the display
of three to four tasks at a time, and scrolling was required to
see the remaining 70 or more pending tasks.

The increased awareness of tasks and colleagues triggered
different reactions. On the appreciative side, a porter said:

Previously, I had a bit of this feeling of “am I the only one making
an effort?” At that time, the phone called all the time, and when
you had just ended a call, the next would come in. I became
stressed. And then you start wondering whether the others just sit
and drink coffee. But now I can see that they are working as much
as I am. And I just take one task at a time, and am aware of what
is most pressing. (Male Porter, 34 years)
However, another porter felt less relief and more stress:

*We still walk incredible distances. More than before, if you ask me. Previously, we could sit down for five minutes, and have a break in addition to the morning and lunch breaks. We can’t, really, any more. Your conscience sees that we are behind. There are always tasks to do.* (Male Porter, 42 years)

For the same reasons, the large screen in porter central displaying all tasks, was often turned off: The porters did not like the beeping and display to tell them that tasks were waiting when having their breaks.

For the clinicians, TMS provided a visible list of all the booked tasks at the department, and they could keep track of whether or not, when and for what time a request had been made, and whether it had been booked by a porter. However, they could not see the locations of porters, or the overall waiting times or workloads of porters. They gained more awareness of their own bookings, but not of bookings of other departments, or the porters’ workload.

*Mentally, if we knew that waiting times were long, then ok. Then that is the situation. It would be nice to know. Maybe, it could be communicated?* (Female Radiographer, 37 years)

For the Radiology Department in particular, the lack of mutual awareness among departments was a problem: In cases of critical incidents, they could not inform the other departments to not send patients:

*When we have a long list of patients coming in from different departments, and a trauma case suddenly arrives, then all plans go askew and we close everything. The problem is that neither porters nor other departments can see that we have a trauma case, and shouldn’t send over any patients.* (Female Radiographer, 37 years)

TMS does not presently support such communication on waiting times or trauma cases at Radiology, for example, because it was primarily developed with the porters in mind.

As for the dispatcher, his function was maintained, though his tasks have changed somewhat. As mentioned, the dispatcher has two screens with overviews of all tasks and the locations of all porters. These large screens provide him with a better overview of all tasks than the porters have on their smartphones, and at times, he intervenes and calls porters to assign them tasks, if he thinks they have missed a nearby or high priority task. Also, he still receives phone calls from departments, mainly concerning the length of waiting times, or technicalities of the TMS. Hence, IT support has become part of his job.

Overall, TMS means improved, though still asymmetrical and partial, awareness of the work arrangement. Porters now know the status of tasks and colleagues and can hence align and articulate work themselves, though gaining a general overview of all tasks is challenging; departments can see their own bookings, but not those of other departments, nor the locations of porters or the overall workload, and although the dispatcher has the best overview of tasks, porter availability and location, he cannot see the actual work, micro-coordination, and local contingencies occurring in the corridors, and at the departments.

**New challenges: Prioritizing and new tasks**

Although improving coordination and communication between porters and departments, TMS also entailed new challenges. Thus, porters reported that departments had begun to book tasks not previously handled by porters, because TMS made booking easier.

*It is a disadvantage of this system that booking is much easier for nurses. All sorts of silly tasks come up. Previously, when they phoned in, you could talk them out of it or tell that “you just have to walk five meters, and your pillows are right there.” Now we get strange bookings, and we do not understand why they do not just do it themselves.* (Male porter, 48 years)

Hence, since communication between departments and porters was now direct, without the dispatcher as intermediary, the screening of bookings was lost.

Without the dispatcher, prioritizing tasks was now done by the departments themselves. Normally, porters prioritize tasks according to when they were booked, though some patient-related tasks have higher priority than others: this includes CT scans, transport of heart, chemo, thrombosis or trauma patients, and tasks from the Emergency Department. At the same time, clinicians at the departments can label tasks as “critical” or “normal.” Although porters take “critical” to mean “life-threatening,” clinicians at times use “critical” in the sense of “urgent” – especially when waiting times are long. An observation note:

*Looking at bookings with an experienced porter. A critical task pops up in TMS. It is red, the sound is different, and it is automatically at the top of the list of the porters’ phones. It says “Patient in wheelchair.” This is not a critical task he says, and is a bit annoyed about the difference between porters’ and nurses’ interpretation of “critical.” Some nurses order “critical” tasks when waiting times are longer.* (Field note, October 2014)

The problem is partly one of perspective. Although departments prioritize depending on a patient’s state, and on their own stress and articulation of work, porters have to prioritize tasks from different departments: They consider their overall workload, knowledge of local contingencies, such as queues at elevators, in addition to understanding “critical” as “life-threatening,” rather than “urgent for us.”

New routines also developed. Since Radiology required many simple tasks demanding little time or within a particular time frame, they agreed with porters to note “23:59” as the required time. These tasks would then be at the end of the list of bookings, and the porters dealt with them whenever appropriate during the day.
Accountability: The Porter Management Info system
Although TMS partially increased awareness and enabled a new kind of cooperation, it was also a technology of accountability. Its database on all tasks included a range of timestamps for when tasks were booked, accepted, commenced, rejected, and completed, and which could be used to visualize and account for porters’ work in different ways.

During the trial implementation the first prototype, which we call Porter Management Info (PMI), the use of the database was developed by the second author. It displayed the number of tasks completed per department, kinds of tasks per week, day, and hour, and average response and waiting times. Through meetings between the vendor, head of logistics, hospital management, dispatcher, and clinicians, three different aims for such a system emerged: a) to report on Porter Central’s performance to hospital management, and pinpoint inefficient organization of hospital logistics; b) to communicate with departments to explain interconnections between their and porters’ work rhythms, and explain how and when increased waiting times emerged; c) to gain insight into porters’ work and optimize it, within Porter Central.

For hospital management, portering services are important, since they influence many other processes, and optimization is a priority. For example, PMI was used to pinpoint which departments would be hardest hit by a planned reduction of elevator capacity owing to maintenance, and thus, management could take preventive measures. Also, the head of the logistics department used PMI to document that Porter Central needed additional staff, if tasks were to be completed on time, and should hire six new employees. Local management sees the potential of being able to investigate work details. The dispatcher said:

S*** always rolls downhill. Every time there is a scolding in this house, it usually comes to us. So I need this to document that there were problems with an elevator, or that a patient was not ready. Maybe a nurse wasn’t present. It’s to keep our slate clean, and show what the real cause for delay is (Dispatcher, 41 years)

As for communication with other departments, an example is the head of logistics using PMI to show Radiology that they were the heaviest users of porter services, and that they tended to book tasks less than five minutes before needing them. Since it took an average of seven minutes to walk from Porter Central to Radiology, the statistics for waiting times were significantly in the negative, and with good reason, since porters would already be behind schedule before commencing these tasks.

Finally, the head of logistics and the dispatcher used PMI as a tool at Porter Central, for staff scheduling and optimization. For example, at a morning meeting, the dispatcher would tell the porters that he could see in PMI that they accepted tasks from the Department of Internal Medicine last, and encouraged them to prioritize these more. However, the head of logistics and the dispatcher did not present the PMI statistics or diagrams to the porters, so for them it was opaque what management could see in PMI. Also, the dispatcher had a large screen in his office showing PMI data, which was not available on the large screen in the porters’ common room.

Porters acknowledged local management’s need for PMI in communication with hospital management and other departments, but were also uneasy about being surveyed:

...I think that is what troubles most of us – the feeling of being surveyed. Everything has to be registered. How long we are to do tasks, and so on. (Male porter, 48 years)

On the other hand, the head of logistics was less worried:

I think the porters know that we, as management, do not survey them … But there is more self-regulation now. And that lessens the need for us to run around and keep an eye on them. We don’t need to, and we don’t bother, either (Head of logistics)

He was more concerned about internal competition and bullying among porters, due to the increased transparency. Depending on the actual use and organizational implementation, this concern may not be totally unfounded: Dershin and Shaik report that “transporter reports” on individual porters’ performance acted as an incentive tool, with management recognizing the best-performing porter, and increasing competition among porters [17; p118]. More generally, Barker describes how self-managing teams ended up tightly monitoring one another’s performances, and enforcing concertive control [6].

However, TMS and PMI also introduce a potential conflict about how to define tasks. The dispatcher and departments understood tasks to begin when a porter arrived at the department, whereas for a porter, a task may begin when he goes to get a wheelchair needed for the task. Similarly, for a porter, a task may not be “complete” when he arrived with a patient at a department, but when he had put back equipment in place:

For me, a task begins when I book it, and it is not over until I have put back the oxygen-pump, lift, and all equipment in their places. So a task may take half an hour, but in management’s terms it has taken 15 minutes. What are we doing in the missing 15 minutes? I think it is wrong to register in that way. I might already commence a task when going to the depot to get a lift. (Porter, 48 years)

TMS did not allow porters to be engaged in two tasks at a time, which, however, might easily be the case: on the way to commence, or during one task, a porter might pick up a piece of equipment needed for the next upcoming task. A strict rule regarding how to register had not yet been enforced, maybe because TMS had only recently been implemented, but if the representations that PMI produces obtain a directing and controlling role, this may change, and a “flip-over effect” may arise [33] [39]: Rather than being a representation of work, PMI may become a procedure for that work. Then, who and how “23:59, “commenced,” “completed,” and the time between tasks (“idle” or “on the move between tasks”) are interpreted becomes important.
All in all, TMS worked as a system for the coordination of portering services and cooperation, and gave porters more influence on, and responsibility for their work, increased awareness of the overall field of work for porters, departments, and local management, though it was still partial and asymmetrical. TMS also made it possible to account for porters’ work, through statistics, diagrams, and provided data on individual tasks, and thus may also be regarded as a technology of accountability.

**DISCUSSION**

The introduction of TMS meant porters had more influence on their work, awareness increased among all collaborators though this was distributed asymmetrically; and that porters’ work was made visible and accountable in new ways, by new actors, including top management. Next, we discuss two aspects of this change: First, the relative openness or configurability of porters’ work arrangement, which suggests possible implications for re-design as well as spurs reflections on the rationales of porters’ work arrangements across settings. Second, the implications of this case for thinking about (in)visibilities and accountabilities of work within CSCW.

**Configurations of hospital porters’ work arrangements**

The present work arrangement was the result of the recent pooling of porters to cover the hospital as a whole, the introduction of TMS, and the working out of new routines and the work arrangement. However, the resulting work arrangement is only one of several possible configurations of how to organize porters’ work, and in the following paragraphs we both suggest new opportunities for design and argue that there is a variety of ways to organize porters’ work. This is in line with studies that point to the configurability and flexibility of the relations between technology and organization of work when designing, implementing and appropriating IT systems [3, 7, 31].

Suggestions for re-design emerge from several contingencies in the present case. First, the function of the dispatcher was maintained, due in part to the need for someone to have an overview of the 70+ ongoing tasks in TMS on a large screen, since overviews on the small screens on the porters’ smartphones were difficult. However, this may be addressed by giving porters tablets or phablets that have larger screens, and, therefore, better support overview. Another reason for keeping the dispatcher’s function was management’s doubts about the porters’ ability to collectively coordinate tasks on their own. However, this could be addressed by developing a culture of responsibility and accountability.

Another contingency is the present asymmetrical (in)visibilities of the work arrangement, which can also be changed. For example, the overview screen for all tasks and porters’ locations could be made available to the departments, and thus give departments information on the porters’ overall workload. Redesigns already suggested by the departments include the display of information on average waiting times, or a chat function, so that porters or the dispatcher can inform departments of challenges of a larger workload, problems with elevators, or Radiology being busy with trauma. As for the porters, PMI statistics could be made available on the large screen in the common room, and be discussed at the morning meetings, in order to show what information PMI has, make its use by the dispatcher and head of logistics transparent to the porters and involve the porters in optimizing their services.

The configurability of work arrangements of porters work can be further elaborated by considering alternatives based on the studies presented in the section on Related Work. At some hospitals, porter services are decentralized, with tasks being ordered and carried out from within wards. In other hospitals, a central dispatcher hands on bookings to teams of four porters, who then coordinate internally on their own. Finally, some hospitals have pooled all porters, and coordinate through a central dispatcher. In several cases, pooling all porters, as in our case, was pursued to ensure greater flexibility and efficiency [15, 16]. In another instance, optimization required a mix of local teams and pooling, to lessen demand on the overall services, by giving the department that used the porters most its own team of porters [29]. Such configurability for technology-work relations is not new [3] [31]. However, as several authors have argued, there is a need to develop approaches to how and why similar work processes using the same technologies differ [ibid]. Randell et al (2011) use multi-cited fieldwork to compare patient handovers and specify the heterogeneity of practices, actors and purposes [35], while Schmidt et al (2007) compare two oncology wards and argue for identifying ‘deep commonalities’ across settings, in addition to making specific design suggestions for specific sites [43].

From the different studies upon porters’ work three specific challenges – or ‘deep communalities’ - can be identified: communication, coordination, and finding the adequate level of staffing. As for the challenge of communication several studies show that insufficient information is a central source of stress, extra work for porters, and delayed completion of tasks, and that thus two-way, direct and hence de-centralised communication between porters and clinicians seem to be called for. However, coordination of distributed actors seems in these studies to call for a central, coordinative place or function such as a porter central and a dispatcher as long as porters do not themselves have overview of all tasks and colleagues. Empirically, the tendency for centralized coordination seems to outbalance the need for direct communication: In one setting, the centralized IT dispatch system could not communicate with porters, who instead had to call the dispatcher for new tasks or clarifications [15]. In another setting, porters received tasks on pagers from a central dispatcher [16]. In a third case, a newly implemented IT system only allowed nurses to send booked tasks via text message to porters, who however, could not respond or call back [52]. Finally, in a
fourth case, two-way radio communication between dispatcher and porters was supported, but not between porters and clinicians [17].

The tendency for centralization is augmented by the third challenge of finding an adequate level of staffing. Since porters and tasks are distributed in space, and the number of unscheduled tasks is high, finding a balance between having enough staff in peak periods, and not having too much idle staff in other periods, requires information on the overall workload during the day and week. Hence management efforts in our case and other studies to generate data on the number of tasks, their duration, waiting, dispatch times, location of porters, and so forth [15-17, 26, 28, 50].

However, the rationales of two-way, direct communication; coordination of tasks; and finding an adequate level of staffing must not necessarily lead to more or less centrally controlled work arrangements: As this study of TMS and the above discussion of the case’s contingencies shows, computer support can be designed in ways that enables decentralized decision-making and lets porters have influence on and responsibility for their work. Whether or not one or the other solution is called for will depend on specific contexts and aims.

Comparative studies of work arrangements – in this case; porters’ work – may serve to point out the specificities and contingencies of single-site studies, as well as the heterogeneity of possible solutions and their overall rationales. Thus, we support the call for studies that go across sites in order to spur to reflections on how IT design, implementation, and appropriation can be formed towards specific contexts and aims.

Accountabilities and visibilities
CSCW systems often simultaneously support cooperative work and are sources of data for the generation of accounts of that work, which has led to noting the dual functions of such systems [18, 49], and the possible conflicts that may arise between accounts for work from “within” and “without” [14, 39]. However, although we acknowledge potential conflicts, we argue that the changes brought about by IT systems in the ecology of (in)visibilities of work go beyond dualisms.

In sociological theory and political science, accountability is an old issue which has received considerable new attention in the last decade, probably connected to the emerged of New Public Management’s combination of centralized control and de-centralised agency. Basically, in these studies accountability is about being answerable to others who can legitimately claim to demand an account of one’s actions [13: p6]. The ensuing central question is then “… who is accountable to whom, for what, by which standards, and why?” [ibid: p10]. The diversity of answers to each of these elements entails a multitude of possible kinds of accountability. For example, distinctions can be made between political, legal, administrative, professional and social accountability depending on the forum to whom accountability is presented; or corporate, collective or individual accountability depending who is asked to be accountable [12]. However, at its core accountability arises from an implicit demand in social relations for actors to be able to provide accounts of their actions.

This is a central theme within ethnomethodology [22]. Thus Suchman (1993) points to the constitutive way in which technologies for ordering and accounting for the movements of lizards and aeroplanes are the same [49], and Bowers et al (1995) show how an IT system designed to account for and make work visible to an external customer, ordered cooperative work in ways that hindered rather than supported this work [14]. Their distinction between workflow as accounted for from ‘within’ and ‘without’ has, with other studies, been influential in pointing out the potential conflicts between ordering and accounting for CSCW systems. For example, Dourish (2001) discusses the ‘dual use’ of workflow technologies and distinguishes between three critical aspects: How IT by the way of ordering work disrupts the natural flow of interaction; how the embedded categorization embedded in this ordering makes certain aspects visible and other not, thus reflecting the order of those to whom accounts are told; and lastly, the theoretical foundations of workflow technologies [18]. He suggests solving the tension between the dual uses by decoupling the presentation of work from its ordering. Further, Eriksen (2002) investigates different meanings of accountability in CSCW and HCI and points to the central question of accountability of what to whom? [19]

In our case, TMS did not at the time of our study have effects that hindered work even though it served to order and make visible that work, especially through PMI. This may be attributed to the fact that TMS, in the sense of Dourish, made work visible and was decoupled from the actual ordering of work which was done by porters themselves (and the dispatcher). At the same time, this study was conducted in the early stages of implementation, and if PMI’s representations for work, including the definition of when tasks begin, are coupled closer to assessments and remuneration of that work, a conflict between accounting and ordering may evolve. Then PMI’s account of work from ‘without’ may, for example, lead management to wonder what porters do in those ‘idle’ 15 minutes in which they go to get, for example, a wheelchair before arriving at the ward. The further away from the porters’ work, the representations of work in TMS and PMI travel the higher the risks of decisions and orderings of work detrimental to situated work practices.

At the same time, our case shows that accounts and representations of work may have multiple roles and effects that go beyond a dualism of ordering and accountability. Thus, for porters TMS provided more influence over their work and assurance that colleagues were also making an
effort, as well as at the same time causing stress due to the continuous stream of incoming tasks, and unease over being monitored. For local management, PMI was used to negotiate for more staff lessening the workload of individual porters; to plan around foreseeable problems connected with maintenance; to discover porters’ attribution of low priority to tasks from a certain department; to work out the staff roster; and to show Radiology that they requested tasks at the last minute. TMS and PMI might also become incentive devices or occasions for bullying. TMS and PMI had both dis- and advantageous effects for the work arrangement, and there is not a clear contrast between ‘good’ before and ‘bad’ after their implementation. Indeed, even the distinction between organizing work from ‘within’ and from ‘without’ breaks down, since TMS increased the transparency of the cooperative arrangement and the common field for work: It was through TMS that porters were enabled to coordinate work themselves. This finally raises the question of whether it is a given that oral narratives are better at accounting for work than tables, schedules, and IT. If ways of ordering work are at the same time ways of making that work accountable, it cannot be assumed that narratives are better at doing this than other media or technologies, even from the actors’ own perspectives.

All in all, we argue for moving beyond a duality between ordering and accounting for work, and propose instead that research on this issue should be guided by a more open question: How is work ordered and made accountable by which technologies and with which effects? EPRs and other healthcare IT as audit tools are not necessarily detrimental to the work of doctors and nurses [53], and may, more generally, be sources of self-reflection and decision-making, as well as of external transparency and the regulation of healthcare [34]. Most likely, this applies more generally for IT systems and work processes.

CONCLUSION:
...the Hospital planned to introduce a computer system which would locate where the porter was on the site at any time, as well as what job he had been allocated, and how long they had been engaged in it. For the present, however, this “Day of Judgement” was a threat only (Rapport, comment on fieldwork on porters in 2000-1 [37: p108])

As the process of digitization of healthcare expands in scope and depth, it will affect non-clinical groups, including porters, registration assistants, social workers, and medical secretaries, who have hitherto received little attention. This paper has described the cooperative work of hospital porters, and the various effects that a coordination and accountability system may have on their work. Their work is understudied, low-paid, physically strenuous, and has a low status. But contrary to expectations, such as Rapport’s, above, we argue that although IT for hospital porters may indeed lead to managerial, “cogs-in-a-wheel” approaches and surveillance, IT can also increase influence on, responsibility for, and reflection on work. The outcomes will depend on the actual design, implementation, and usage. Porters’ and other professions’ work can be configured in various ways to the enrichment or detriment of work life and organizations. Detailed studies, as well as comparisons, can open up the contingency of actual work arrangements and open up a spectrum of possible configurations. Finally, we argue to move beyond a dualism between coordination of and accountability for work, since these are interrelated and co-constitutive.

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