An Emotion-Focused Approach Towards Improving Clinicians' Work-Related User Experience

DIANE GOLAY
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Abstract

Recent studies have associated clinician burnout with health information technology use. Researchers have attributed this negative impact of health information technology use on clinician well-being to poor system usability and insufficient clinician involvement in system design and implementation.

Against this backdrop, this thesis first examined the discrete negative and positive emotions that clinicians experience at work in connection with health information technology use, and defined desirable user experience goals for health information technology design and implementation. Second, it identified different breakdowns in the communication between hospital nursing staff and information technology staff members.

Data were collected through focus groups and interviews with registered nurses, nursing assistants, physicians, and information technology staff members working at or affiliated with a large Swedish hospital. The data were analyzed qualitatively through thematic analysis.

Hospital nursing staff and physicians were found to experience frustration, perplexity, anxiety, alienation, psychological and moral distress, joy, relief, relaxation, and confidence in connection with their work-related use of health information technology. On this basis, joy, relaxation, confidence, gratitude and pride were identified as desirable user experience goals for clinicians' work-related information technology use. Finally, breakdowns in the communication between hospital nursing staff and information technology staff members were found to include lack of user studies, low-level filtering of nursing staff's electronic error reports, unintelligible electronic error reports, and nursing staff not attending in-person training sessions and not checking information technology-related communications on the intranet.

These findings contribute to the field of human–computer interaction by shedding light on information technology staff members' work and on clinicians' work-related user experience, and by defining user experience goals for clinicians' work-related information technology use. Health information technology designers and implementers can draw from these findings to foster clinician well-being through the design of health information technology systems and routines.

Diane Golay, Department of Information Technology, Computerized Image Analysis and Human-Computer Interaction, Box 337, Uppsala University, SE-75105 Uppsala, Sweden.

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List of papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.

I Golay, D., Cajander, Å., & Salminen-Karlsson, M. Information Technology Use and Tasks Left Undone by Nursing Staff: A Qualitative Analysis. Accepted with revisions for publication in the Health Informatics Journal.


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Publications not Included in this Thesis


Svensk sammanfattning

E-hälsa har haft målet att göra vården effektivare, säkrare, och billigare. Dessa mål har dock inte än nåttts. Dessutom har användningen av e-hälsa haft olika negativa konsekvenser för vårdpersonalen, bland annat merarbete och arbetsfördröjningar. Nyligen publicerade studier visar även ett samband mellan användningen av e-hälsa och utbrändhet bland sjuksköterskor och läkare. Låg användbarhet och bristande samarbete med vårdpersonalen i designen och implementeringen av e-hälsa bidrar till detta svåra läge.

Denna avhandling undersöker de känslor som vårdpersonalen upplever på jobbet i samband med sin arbetsrelaterade användning av e-hälsa, och de kommunikationsproblem som uppstår mellan förvaltare av e-hälsa och vårdpersonalen. Målet är att skapa kunskap som leverantörer och förvaltare av e-hälsa kan dra nytta av för att skapa e-hälsosystem och -rutiner som främjar vårdpersonalens upplevelse av positiva känslor i samband med den arbetsrelaterade användningen av e-hälsa. Detta gynnar vårdpersonalens välbefinnande.

Den forskning som presenteras kring vårdpersonalens upplevelse av att jobba med e-hälsa fokuserar på sjuksköterskor, undersköterskor, och läkare som jobbar kliniskt på ett sjukhus. Genom fokusgrupper och intervjuer samlades negativa och positiva berättelser om dessa yrkesgrupper dagliga arbetsliv med e-hälsa. Sedan analyserades de här berättelserna kvalitativt, och varje berättelse kopplades till en eller fler specifika känslor. Resultaten tyder på att sjuksköterskor, undersköterskor, och läkare kan uppleva frustration, stress, skuld, alienation, ovisshet, oro, glädje, lättnad, tillit, och avslappning i samband med sin arbetsrelaterade användning av e-hälsa. Dessutom pekar resultaten på att uppfattningar av lätthet och trygghet är centrala i vårdpersonalens positiva upplevelse av e-hälsa; uppfattningar av onödig ansträngning, saknad kunskap eller förståelse och risk för fel var kopplade till negativa känslor, medan uppfattningar av lätthet, visshet och säkerhet var kopplade till positiva känslor. Med detta som underlag formulerade jag olika upplevelsemål som e-hälsoleverantörer och -förvaltare kan sträva efter när de designar e-hälsosystem eller -rutiner. Dessa upplevelsemål är riktade mot att främja vårdpersonalens upplevelse av glädje, avslappning, tillit, stolthet och tacksamhet i samband med sin arbetsrelaterade användning av e-hälsa.

Vad gäller kommunikationsproblemen mellan e-hälsoförvaltare och vårdpersonalen fokuserar denna avhandling på IT-personalen knuten till ett sjukhus och sjuksköterskorna som jobbar kliniskt på detta sjukhus. Intervjuer genomfördes med IT-medarbetare och datan analyserades kvalitativt med ett fokus på kommunikation och kommunikationsproblem. Resultaten tyder på att det
finns problem både i den kommunikation från sjuksköterskor till IT-personalen och från IT-personalen till sjuksköterskor. Inte alla problem som sjuksköterskor rapporterade elektroniskt nådde IT-personalen, och IT-personalen hade svårt att tyda de felrapport som kom fram till dem. IT-personalen insåg dessutom att (för) få sjuksköterskor läste igenom den e-hälsorelaterade informationen de publicerade på intranätet, och att (för) få sjuksköterskor kom till de IT-utbildningar som de erbjud. IT-personalen medgav även att de saknade resurserna för att genomföra stora användarstudier med sjuksköterskor och utbilda alla sjuksköterskorna på sjukhuset inom användningen av e-hälsosystem.

De här resultaten har olika implikationer för praktiken. Först pekar de på att e-hälsleverantörer och -förvaltare behöver stödja vårdpersonalen bättre i att genomföra sina arbetsuppgifter med e-hälsa, förstå logiken som e-hälsosystem använder, och etablera arbetsrutiner i och kring e-hälsa. För det andra tyder resultaten på att funktioner som sparar vårdpersonalens tid, förser dem med kognitivt stöd och hjälper dem att lätt visualisera hälsodata kan gynna deras upplevelse av positiva känslor. Dessutom visar forskningen att e-hälsöförvaltare behöver skapa nya kanaler för att kommunicera med sjuksköterskor på ett effektivt sätt; de här nya kanalerna borde lägga största delen av kommunikationsbörдан på organisationen i stället för på sjuksköterskor eftersom e-hälsorelaterade kraven på sjuksköterskor redan är för höga. Slutligen kan e-hälsöförvaltare behöva upphandla ny hårdvara som klarar de senaste e-hälsosystemens tekniska krav samt öka (och, vid upphandling, prioritera) kompatibiliteten mellan de olika e-hälsosystemen inom organisationen.
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List of Abbreviations

CPOE   Computerized Provider Order Entry
CS     Comprehensive Summary
DISA   Digitalisering och dess effekter på Sjuksköterskors Arbetsmiljö (digitalization and its effects on nurses’ work environment — research project 1)
EHR    Electronic Health Record
EPJ    Elektronisk PatientJournal (electronic patient record — Information Technology staff unit at the county level)
FASS   Farmaceutiska Specialiteter i Sverige (Swedish reference website for drug-related information)
FG     Focus Group
HCI    Human—Computer Interaction
HTO    Health, Human, Technology (my research group)
MO     Medication Order
NA     Nurse Assistant / Nursing Assistant
NDDS   National Dose-Dispensing System
IT     Information Technology
OR     Operating Room
PACU   Post-Anesthesia Care Unit
RN     Registered Nurse
RQ     Research Question
SWERA  Swedish Ethical Review Authority
UH     University Hospital
UX     User eXperience
XWEL   user eXperiences With ELectronic medication orders (research project 2)
When I first started inquiring into the effects of digitalization on hospital nursing staff’s work environment, I wanted to understand what everyday work with information technology (IT) systems was like for registered nurses (RNs) and nursing assistants (NAs). My first visits to the Uppsala University Hospital (UH) made me aware of the negative impact that IT implementation and IT-supported work practices had on some members of the nursing staff. The five focus groups that I subsequently conducted with RNs and NAs from different units added to these first impressions of IT use as a constant source of struggle for nursing staff. Therefore, my initial analyses of the collected data focused on shedding light on the nature and consequences of this struggle. This initial analytical work made no attempt to interpret the inner world of nursing staff. Rather, it centered on the activities nursing staff reported doing (e.g., tasks IT use “created” in their daily work life) and failing to do (i.e., tasks left undone — the subject of Paper I).

This led me to examine IT staff members’ perspectives on nursing staff’s IT use. I wondered: to what extent are health IT managers aware of nursing staff’s struggle with IT? I co-supervised two student theses that examined IT staff members’ perspectives on and work with nursing staff’s IT-related needs. Although the findings did not provide me with a clear answer to my question, they did show breakdowns in the communication between nursing staff and IT staff — the subject of Paper V.

At around the same time, I attended a course on user experience (UX). Reading John Dewey’s *Art as Experience* marked a turning point in my research. Indeed, Dewey addresses the impact of work design (i.e., what workers are asked to do) on workers’ well-being, stressing the need to provide workers with work conditions that allow them to experience “aesthetic fulfillment.” On this basis, I became interested in the following question: how should we design clinicians’ IT tools to foster their positive experience of work?

At this stage, I immersed myself in the literature on UX and related concepts. I examined different conceptualizations of UX, different approaches to design for positive experiences, subjective well-being and/or personal growth, and tools to work with emotions in the design process. I realized that I needed to examine both negative and positive experiences to understand how to design for nursing staff’s well-being, as fostering well-being is about both reducing negative experiences and supporting positive ones. Since my data so far were mostly about negative experiences, this meant that I needed to collect more data. Therefore, I interviewed six additional RNs about their positive experiences of work-related IT use. My next step was to analyze my data about
RNs’ negative and positive experiences of work-related IT use through a UX lens. On the basis of studies and typologies of emotions in human—computer interaction, my analytical procedure centered on identifying the thoughts (cognitive evaluations) and emotions at the heart of my participants’ experiences. This allowed me to identify negative and positive IT-related emotions that RNs experience in their daily work (Papers II and III).

Simultaneously, I was given the opportunity to participate in a new project at UH. I interviewed 10 physicians about their positive and negative experiences of working with electronic medication orders (MOs) and analyzed the data, following a procedure similar to the one developed for my study about RNs. In addition, I used my findings about the thoughts (cognitive evaluations) and emotions physicians experience at work in connection with electronic MOs to formulate UX goals (Paper IV). These UX goals are one way to answer the question I have sought to address through my research: how should we design clinicians’ IT tools to foster their positive experience of work?
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References
1. Introduction

Several Western countries, including Sweden, Norway, Denmark, the UK and the US, have massively invested in the implementation of information technology (IT) in health care organizations [36, 110]. Today, most health care processes in these countries are supported by health IT systems [62, 88], such as electronic health records (EHRs) and computerized provider order entry (CPOE) systems. The move from paper-based to digital information management was envisioned to improve the efficiency, safety, quality, and cost-effectiveness of care [42]. However, these expected benefits have not yet fully materialized [58]. Indeed, although IT implementation and use have solved many of the shortcomings inherent in paper-based information management, they have also introduced new challenges and problems into clinicians’ work lives. Nursing staff and physicians have, for example, reported that health IT systems, due to their poor usability [76], impede and slow them down in their work [12, 62, 75, 98, 100, 104], increase their cognitive burden [75, 100, 104, 103], and jeopardize patient safety [98, 104]. Recent studies even suggest that health IT use is contributing to nurse and physician burnout [62, 64].

In this context, my research has aimed to support health IT designers (e.g., health IT vendors) and implementers (i.e., IT staff in health care organizations) in improving hospital clinicians’ experience of working with IT. The studies I present in this thesis have addressed two different problem spaces and research gaps in the literature related to this aim.

The first of these is the user experience (UX) of hospital nursing staff and physicians, that is, the thoughts and emotions they experience in connection with work-related IT use [94]. Three of the five papers I present in this thesis examine the distinct emotions that work-related IT use can evoke in hospital nursing staff and physicians. Few studies have applied such an emotion-focused approach to examining work-related UX. However, a nuanced approach to emotions — working with discrete emotions as opposed to undifferentiated positive and negative affect — can foster empathy for end users and, thus, positively affect the design process [119]. In one of my papers and in this comprehensive summary (CS), I have used my findings on the UX of hospital nursing staff and physicians to formulate positive UX goals for their work-related IT use. These positive UX goals are meant to guide health IT design and implementation processes. Indeed, a first and essential step in UX design is to determine what (positive) experiences to design for [44, 114]. However, there is a lack of knowledge about what target experiences (i.e., UX goals) to
design for in work settings — both in general and more specifically when it comes to the work-related UX of hospital nursing staff and physicians [16]. In addition, to my knowledge, none of the UX goals that have been proposed for work-related IT use in health care focus on emotions. In contrast, each one of the UX goals I propose in this thesis targets a specific positive emotion. Such an approach increases the likelihood of UX goals becoming a reality [119, 118].

The second problem space and research gap that my work has addressed is communication between health IT implementers and clinicians. Successful communication between implementers and end users is critical for the success of IT implementation projects [6]. In spite of this, little has been written about health IT implementers’ work and about the (potential) breakdowns they experience in their communication with clinicians [15]. Therefore, I have examined the communication issues between hospital nursing staff and IT staff — from the perspective of IT staff members. By shedding light on these issues, my work seeks to support health care organizations in better communicating with and involving end users, and especially nursing staff, in the design and implementation of health IT. As end-user involvement is widely considered to be a prerequisite for satisfactory UX [63], such an improvement can be expected to contribute to fostering a positive work-related UX for clinicians.

Ultimately, my research assumes that improving clinicians’ work-related UX is likely to foster their well-being at work by promoting their experience of positive emotions and reducing their experience of negative emotions at work. Indeed, positive emotions are generally associated with well-being, while negative emotions are typically associated with negative outcomes [50]. The broader motivation for my research is, therefore, to foster clinicians’ well-being at work.

1.1 Papers

This comprehensive summary is based on five papers (I—V). These five papers are based on four studies (A—D), which were part of two different research projects, DISA and XWEL.

DISA (digitalisering och dess effekter på sjuksköterskors arbetsmiljö — digitalization and its effects on nurses’ work environment) aimed to investigate the effects of health IT implementation and use on nursing staff’s psychosocial work environment. Forte (forskningsrådet för hälsa, arbetsliv och välfärd — the Swedish research council for health, working life and welfare) funded the three-year research project. Most of my research group (i.e., the Human, Technology, Organization (HTO) research group) was involved in the project, which ran from 2016 to 2020 and comprised different research tracks. One track focused on nursing staff’s experience of daily health IT use; another track centered on the impact of the patient-accessible EHR on nursing staff;
and a third one looked into health IT managers’ (i.e., health IT staff members’) work. Studies A and B (Papers I—III) in this thesis were part of the first track, and Study D (Paper V) of the third track.

XWEL (user eXperiences With ELeetronic medication orders) aimed to identify requirements for a new health IT system that would screen the medication lists of all patients admitted to the Uppsala University Hospital and, if needed, issue warnings to a centralized team of clinical pharmacists. As the system would affect the collaboration between physicians, nursing staff, and pharmacists working locally in different wards, it was necessary to examine these stakeholders’ psychosocial needs related to electronic medication orders (MOs). Study C (Paper IV) was part of this effort and focused on hospital physicians’ positive and negative work experiences connected with their use of electronic MOs.

Figure 1.1. Overview of the projects, studies, papers, participants, and methods included in this thesis.

Figure 1.1 gives an overview of the projects, studies, papers, participants, and methods included in the thesis. Papers I, II and III have some data in
common; Papers II, III and IV share a similar analytical procedure, which was centered on user experience (UX) and emotion-focused.

1.1.1 Paper I
Paper I, titled *Information Technology Use and Tasks Left Undone by Nursing Staff: A Qualitative Analysis*, has been accepted with revisions for publication in the *Health Informatics Journal*.

**Short Summary**
This paper examines the interplay between work-related IT use and tasks left undone by hospital nursing staff. It is based on interviews and focus groups with registered nurses (RNs) and nursing assistants (NAs) about their experiences related to work-related IT use. I identified tasks left undone as a common theme across these interviews and focus groups, and decided to take a closer look at this phenomenon. I selected all excerpts from the data that I found related to tasks left undone and examined the nature of both the tasks left undone and their antecedents. My findings suggest that 1) nursing staff avoid or leave both nursing and non-nursing IT-supported tasks undone and, 2) IT-related factors cause nursing staff to leave nursing tasks undone. Consequently, this article is a call for future research on the interplay between work-related IT use and tasks left undone — a call for researchers to look at both what clinicians do and do not do in relation to IT use.

**My Contribution**
I am the main author of this paper. I was the main contributor in planning and moderating the focus groups, transcribing the recorded data, and writing the paper. I conducted the analysis single-handedly.

1.1.2 Paper II
Paper II, titled *Negative Emotions Induced by Work-Related Information Technology Use in Hospital Nursing*, was published in the nursing informatics journal *Computers, Informatics, Nursing* in 2022.

**Short Summary**
The paper examines RNs’ negative experiences connected with work-related IT use from an emotion-focused perspective. The main question is, to what negative emotions felt at work does work-related IT use contribute? As negative emotions felt at work have been associated with nurse burnout, there is a need to minimize their occurrence to promote RNs’ work well-being. I identify six negative emotions RNs experience in connection with work-related IT use and describe the situations and cognitive evaluations that evoke them. To
my knowledge, this paper is the first to examine ward RNs’ work-related IT use from a UX-centered and emotion-focused perspective. I believe it is a first step towards (re)designing health IT systems and practices that foster RNs’ work well-being.

My Contribution
I am the main author of this paper. I planned the interviews, recruited participants, and moderated all but one interview. I transcribed and analyzed the data (i.e., negative experiences) single-handedly. I was the main contributor in writing the paper.

1.1.3 Paper III
Paper III, titled *Effortlessness and Security: Nurses’ Positive Experiences with Work-Related Information Technology Use* was published in the nursing informatics journal *Computers, Informatics, Nursing* in 2022.

Short Summary
This paper examines RNs’ positive experiences connected with work-related IT use. It is the “flipside” of Paper II — it follows the same analytical procedure and has the same focus on emotions and cognitive evaluations, but with positive instead of negative experiences of work-related IT use. I identify four positive emotions RNs experience in connection with work-related IT use and describe the situations and cognitive evaluations that evoke them. Understanding the nature and eliciting conditions of positive experiences can support health IT designers and managers in (re)designing health IT systems and practices that foster RNs’ work well-being.

My Contribution
I am the main author of this paper, which is based on the same interviews as Paper II, though on a different part of the data (i.e., positive experiences). I conducted the analysis single-handedly and was the main contributor in writing the paper.

1.1.4 Paper IV
Paper IV, titled *An Emotion-Driven Approach to Hospital Physicians’ Work-Related User Experience*, was presented at and published in the proceedings of the 10th Nordic Conference on Human-Computer Interaction (i.e., NordiCHI ’22).

Short Summary
The paper applies a UX-centered and emotion-focused approach similar to that applied in Papers II and III to physicians’ work with electronic MOs. I
identify six different cognitive evaluations at the heart of physicians’ positive and negative experiences of working with electronic MOs and associate them with five different emotions. On this basis, I formulate four positive UX goals. These goals can be used to guide the (re)design of health IT systems and practices that foster physicians’ work well-being.

My Contribution
I am the main author of this paper. I planned the study and conducted all interviews. I also transcribed some of the interviews. The analysis I present in the paper is my own, though I discussed it with the second author, who did her own coding of the data. I was the main contributor in writing the paper.

1.1.5 Paper V

Paper V, titled *Communication Breakdowns between Nurses and IT Department: Why Hospitals Fail at Improving the Usability of Health Information Technology* was presented at and published in the proceedings of the 18th International Symposium on Health Information Management Research (i.e., ISHIMR 2020).

Short Summary
This paper is based on interviews with IT staff members at a large Swedish hospital. The participants were asked about their views on nursing staff’s work-related IT use and IT-related challenges. On this basis, I took a closer look at the channels that IT staff used to communicate with nursing staff. In the paper, I present these different channels together with the communication breakdowns participants mentioned in the interviews. As IT staff members play a significant role in shaping nursing staff’s experience of work-related IT use, it is necessary to find ways to improve these two professional groups’ mutual understanding of each other’s needs and values. This paper is a first step in this direction.

My Contribution
I am the main author of this paper, which is based on two student theses [51, 5] that I co-supervised. I was the main contributor in writing the paper.

1.2 Research Questions and Aims

As I have explained above, my work centers on two different problem spaces: 1) the UX of hospital nursing staff and physicians, and 2) the communication between hospital nursing staff and IT staff. I address these two problem spaces through three research questions (RQs), which I present below. Figure 1.2 maps Papers I-V to these three RQs.
I approach the UX of hospital nursing staff and physicians through two different RQs. The first RQ focuses on understanding those clinicians’ current experiences of working with IT through an emotion-focused lens:

**RQ1** What discrete positive and negative emotions does work-related IT use evoke in hospital nursing staff and physicians?

The second RQ centers on defining target positive experiences — UX goals — for hospital nursing staff’s and physicians’ work-related IT use. By facilitating those goals (i.e., by creating working conditions in which these target experiences can emerge), health IT design and implementation may benefit clinicians’ well-being at work by increasing their experience of positive emotions at work.

**RQ2** What UX goals should health IT designers and implementers facilitate to foster nursing staff’s and physicians’ well-being at work?

My third and last RQ examines communication issues between hospital nursing and IT staff members from the latter’s perspective:

**RQ3** What breakdowns do information technology staff members see in the communication between hospital nursing staff and information technology staff?

This thesis contributes to the HCI field in three main ways. First, it sheds light on hospital nursing staff’s and physicians’ experiences of work-related IT use, and presents UX goals for health IT design and implementation. Second,
it takes an emotion-focused perspective to examine clinicians’ UX and define UX goals. Finally, it answers the call for more research on IT staff’s work by examining the communication breakdowns that exist between hospital nursing staff and IT staff. From a global perspective, the findings presented in this thesis inform the well-being-driven design of health IT systems and practices, and provide concrete guidance on how to foster clinicians’ experience of positive emotions at work through IT-related measures.

1.3 Thesis Outline
Chapter 2 provides some background on the roles of hospital nursing staff and physicians in the hospital setting. It seeks to give the reader an understanding of the responsibilities and tasks of the different roles included in my research. Next, Chapter 3 gives a brief overview of health care digitalization, health IT, and what is known of the impact of health IT use on the work and well-being of nursing staff and physicians.
In Chapter 4, I introduce socio-technical design and user experience-centered design — two broad approaches to designing technology that have taken workers’ well-being into consideration. Sections 4.2.1 — 4.2.4 take a closer look at UX and UX research in the workplace. Finally, in Section 4.3, I explain the importance of end-user involvement for successful health IT design and implementation.
Then, in Chapter 5, I describe my research setting.
The details of my methodology are presented in Chapter 6. This method chapter first presents the main ontological, epistemological, and ethical considerations that have guided my research. It then describes the data collection and analysis procedures that I have followed in my studies and in this CS. Finally, I discuss the main quality criteria that I have taken into consideration throughout my studies.
Chapter 7 presents my findings for RQs 1—3. These findings are then discussed in Chapter 8.
Limitations and recommendations for future work are addressed in Chapter 9. Finally, Chapter 10 closes this CS with a conclusion.
2. Nursing Staff and Physicians in the Hospital Setting

This thesis focuses on nursing staff and physicians working clinically in the hospital setting — hospital RNs, NAs, and physicians having, at least to some extent, direct contact with patients. Nursing staff and physicians have different roles in the clinical process. Sections 2.1 and 2.2 below take a closer look at each role.

2.1 Registered Nurses and Nurse Assistants in the Hospital Setting

Nursing staff monitor, deliver, coordinate, and manage patient care [39]. Thus, nursing tasks include washing, feeding, mobilizing, educating, and administering medications to patients, providing emotional and psychological support to patients and their relatives, and attending interdisciplinary care meetings [85, 99]. Care documentation is also an integral part of nursing [85, 99].

In Swedish hospitals, nursing care is usually provided by hospital RNs and NAs working as a team. RNs and NAs have distinct duties in that team, in which the NA works under the authority of the RN. RNs can take over a NA’s care duties, which are typically hands-on bedside tasks, but the reverse is not true. In particular, only RNs are educated and authorized to dispense and administer medication to patients according to physicians’ orders (see below).

The daily work life and duties of RNs and NAs can vary significantly depending on the type(s) of care unit they work at and their specialization. For example, a day in the life a ward RN or NA differs from that of an RN or NA working in an operating room (OR). There are also various nursing specializations. In the OR for instance, nurse anesthetists and OR RNs have completely separate areas of responsibility, and also occupy different spaces in the OR. Nurse anesthetists sit towards the head of the patient’s bed and monitor the patient’s vital signs, while the OR RN stands on the side of the patient’s bed and assists the surgeon throughout the procedure. Moreover, as different wards work with different types of patients (e.g., children, adults, elderly people) and conditions (e.g., cancer, orthopedic injuries), ward RNs’ and NAs’ work routines also vary from one ward to another.

RNAs play an essential role in the provision of safe and high-quality care, and the quality of their work environment is correlated with patient outcomes.
In spite of this, RNs have always had a relatively low status in the health care hierarchy and have had to deal with difficult working conditions [112]. This is at least in part because, at the time it emerged, the nursing profession (comprising only women) was perceived as a threat to the status of physicians (all men) [112]. Therefore, it was established as a clearly distinct and, above all, subordinate activity [3]. RNs’ historically low status naturally affects their relationships with other health care professionals, where the power imbalance is typically to their disadvantage [3, 112]. Moreover, RNs “are often reduced to persons speaking for others rather than being regarded as persons speaking for themselves” [73, p.167]. This often results in their concerns being dismissed.

In addition to factors related to the history and nature of the nursing profession, recent health care and societal developments have brought new challenges into RNs’ work lives. Some of these challenges and constraints include more acutely ill patients, accelerated patient throughput due to resource containment requirements, higher care specialization, and reductions in the number of RNs, as well as increased demands for paperwork and data entry [3]. RNs’ current everyday work is thus characterized by staff shortages, increased workloads, acutely ill patients with co-morbidities, budget constraints, and increased administrative work [3, 112]. They also need to keep up with rapid increases in new knowledge and technology and the increased complexity of their work environment [57].

A consequence of the high demands and low resources nursing staff need to work with every day is that both RNs and NAs do not have time to complete all their tasks [55]. Consequently, they need to abbreviate, delay, and omit some of their tasks [57], which can induce negative emotions such as moral distress, frustration, and worry [55]. Additionally, the nature of nursing work — characterized by shift work and intense emotional labor [53] — combined with nursing staff’s difficult working conditions make nursing professions susceptible to burnout [107].

2.2 Physicians and Medication Orders in the Hospital Setting

Physicians diagnose patients and order the corresponding care [39]. Put another way, they are responsible for determining and ordering the treatment that should be given to a patient [39]. That treatment typically includes medication administration, which is a core component of hospital care [80]. In the inpatient setting, physicians communicate with RNs about the treatment regimen that is to be provided to a patient through MOs [9, 72]. In the outpatient setting, they use prescriptions rather than MOs [9]. As MOs and prescriptions provide information about patient treatment, they are a part of care documentation and play a role in physicians’ clinical assessment of their patients [1].
3. Health Information Technology and Its Impact on Hospital Nursing Staff and Physicians

This chapter provides some background on the digitalization of health care in Western countries (Section 3.1) and introduces some of the most common types of health IT systems (Section 3.2). Then, it gives a brief overview of the positive and negative effects of health IT implementation and use on nursing staff and physicians (Section 3.3).

3.1 Health Care Digitalization

As a domain that is composed of many different professions and specializations, health care is very fragmented [18]. In a hospital, labor is distributed across multiple, highly specialized units and departments [3]. Thus, hospitals are extremely complex, knowledge-intensive, and technologically rich organizations [3]. In this context, paper-based information management presents many shortcomings. For instance, poor legibility has been identified as a cause of medication administration errors [84, 122]. Digitalization has been envisioned to overcome the limitations of paper-based information management [121] by bringing “what was informal and impermanent into permanence and formality” [121, p.44]. The increased accountability, reduced risk of errors, and facilitated sharing of real-time information that the shift to digital information management promised [121] was expected to improve the “efficiency, cost-effectiveness, quality and safety of medical care delivery” [42, p.w282] as a whole. Consequently, multiple Western countries, including Sweden, Norway, Denmark, the United Kingdom, and the US [36, 110], have invested massively in the implementation of health IT [32]. In their 2019 paper, Carayon and Hoonakker [15, p.71] consider that, today, “the basic [health] IT infrastructure is in place.”

3.2 Health Information Technology

Health IT is an umbrella term referring to different types of IT systems used within healthcare for clinical and administrative purposes [108, 113]. Other designations, such as health care IT, health management information systems,
health information systems or healthcare information systems are also in use [108].

Administrative health IT systems contain “primarily administrative or financial data and […] support the management functions and general operations of the health care organization” [113, p.67]. Such administrative systems can for example serve patient billing or staff scheduling [113].

Clinical information systems contain “clinical or health-related information used by providers in diagnosing and treating a patient and monitoring that patient’s care” [113, p.67]. Two of the most widely implemented — and researched — clinical health IT systems are EHRs and CPOE systems. In their most basic forms, EHRs support clinical documentation of patient status and treatment (i.e., they are electronic patient records) and CPOE systems support the creation of electronic medical orders, including MOs, lab tests, and radiology tests. However, many EHRs today are multifunctional and encompass a variety of features [65], blurring the boundaries between different types of health IT systems. For instance, in addition to clinical documentation, an EHR may include CPOE, medication lists, and computerized decision support (CDS), among other functionalities [47, 65, 80, 108]. Electronic medication lists comprise all of a patient’s electronic MOs, which physicians and other prescribers create through CPOE systems [122]. CDS applications warn prescribers of potential medication safety problems, such as interactions between drugs and allergy-related incompatibilities [1].

Thus, it is important to keep in mind that health IT, as a term and a concept, refers to multiple — often complex [103] — systems with different purposes, contents, and application areas. In addition, hospitals have commonly acquired their various health IT systems from different IT vendors, which means that those systems have different implementation technologies and architectures and, therefore, are not (fully) interoperable with each other [32, 95, 103].

Finally, although, “today, the basic [health] IT infrastructure is in place” [15, p.71], this infrastructure is constantly changing. Indeed, health care organizations are “adding new information tools, replacing existing EHRs with new ones, updating software to new versions, and undergoing changes to organizational routines that lead to altered usages of information systems” [88, p.689].

3.3 Impact of Health Information Technology Use on Nursing Staff and Physicians

As a result of the broad implementation of health IT in Western hospitals, much of health care documentation and communication, including the medication process [122], has become computer-supported [62, 88]. For nursing staff and physicians, the EHR and other health IT systems have become standard
work tools [98]. This has dramatically altered the work lives of nursing staff and physicians [32, 88, 100] — in both positive and negative ways [17, 105].

One of the most frequently mentioned benefits of health IT implementation and use for both nursing staff and physicians is easy access to clinical information [4, 30, 62, 91, 97], in part due to the improved readability of notes [30, 62, 38]. Both nursing staff and physicians also report that IT use has increased the safety of the medication process [12, 30, 62, 122, 13]. For instance, a 2019 survey study found that physicians were highly satisfied with some of the CDS functionalities available during MO entry [98]. Similarly, in a 2019 qualitative interview study, nurses referred to IT-enabled safety mechanisms as a “safety net” [13, pp.77-78].

Simultaneously, previous research shows that health IT implementation and use can also have both short- and long-term negative effects on clinicians’ work [91, 98]. Both nursing staff and physicians have reported that health IT systems, due to their poor usability [76], impede and slow them down in their work [12, 62, 75, 98, 100, 104], and increase their cognitive burden [75, 100, 103, 104]. Some of the reported issues include task repetition [62] (e.g., having to log in multiple times per day [91, 98]), a high number of clicks per task [62, 97], unnecessary workflow steps [12, 62, 122], excessive data entry [62, 91], and interruptions and delays due to technical issues [13, 91, 98, 100]. Both nursing staff and physicians feel that they need to spend an excessive amount of time on IT-supported tasks [62, 75, 100, 104]; nursing staff have even reported that the time spent documenting in the EHR could impinge on time spent with patients [12, 30, 97]. Moreover, nursing staff and physicians have been found to address perceived blocks in their workflow by devising workarounds [12, 30, 38, 91].

In addition to efficiency and time-related issues, nursing staff and physicians also feel that health IT use has introduced (new) threats to patient safety in the form of new opportunities for errors [98, 104]. Interestingly, some of the workarounds used by nursing staff and physicians seem to contribute to this increased risk of error [91, 95].

The mixed impact of health IT use on the work of nursing staff and physicians has seldom been addressed from an emotion-focused perspective. Some, largely negative, emotions evoked by health IT use are mentioned in the literature. For example, multiple studies report that health IT-related issues cause frustration among nursing staff and physicians [62, 76, 104, 83]. However, these identified health IT-induced emotions are typically not the focus of the study and their potential implications for clinicians’ well-being or health IT design are not discussed. In contrast, burnout has been a more prevalent subject of study in the health and nursing informatics literature, and multiple studies have examined the correlation between health IT use or usability and odds of burnout among nursing staff or physicians [64, 75, 76, 83, 100]. More specifically, perceived low EHR usability has been found to be associated with higher odds of burnout among both physicians [75] and nursing staff [64, 76].
Moreover, a 2014 survey found that CPOE was associated with a higher risk of burnout among physicians [100]. In summary, these studies suggest that health IT use and poor health IT usability can contribute to clinician burnout, which means that health IT implementation and use can be detrimental to clinicians’ well-being at work.

On this basis, Johnson et al. [54, p.970] called for “a renewed interest in understanding clinicians’ experience using the modern EHR” to implement well-designed health IT successfully. In addition, several opinion papers have called for well-being-driven interventions to mitigate clinician burnout and promote clinician well-being [100, 10, 101]. Thus, there is a need for an approach to health IT design that takes well-being into account.
4. Humanistic Approaches to Designing Technology

In this chapter, I introduce two different humanistic approaches to designing technology: socio-technical design (Section 4.1) and UX-centered design (Section 4.2). I refer to these two approaches as humanistic because they both emphasize the necessity for technology design to safeguard and enhance people’s well-being. I then explain the importance of end-user involvement in shaping the usability of (health) IT systems and the user experiences emerging from the use of these systems (Section 4.3).

4.1 Socio-technical Design: Designing Satisfactory Work Experiences

In the 1950s, socio-technical design emerged as a humanistic approach to designing technology-mediated work practices in organizations [82]. It challenged alienating work organization trends that “subordinated [workers] to the machine” [82, p.337] and offered them no possibility of personal development or job satisfaction [82]. In contrast, socio-technical design has had the aim of considering human needs when introducing technical systems into organizations and using technical change to design satisfactory work experiences for workers [82, 60]. In this context, it has operationalized high-quality work [28, 82] as work that:
• is reasonably demanding;
• provides opportunities for learning;
• allows for some degree of decision-making;
• offers social support;
• can be related to social life;
• and leads to a desirable future.

Socio-technical design introduces two notions to support the creation of high-quality work through technological change. First, it argues that the technical and social aspects of work need to be optimized jointly [82, 2, 68]. Indeed, socio-technical design sees the technology and the people in a work system as interdependent: “technology affects the behavior of people, and the behavior of people affects the working of the technology” [60, p.138]. Therefore, it argues that technical demands and workers’ needs should be given equal weight in the design of technology-mediated work practices [28, 82].
Put another way, technical demands should not be prioritized over human needs. Second, socio-technical design asserts that the process of defining new, technology-mediated work practices should be democratic; it defends workers’ rights to define their own needs and co-design their work practices through a participatory process [82].

4.2 Human—Computer Interaction: From Designing Usable Artifacts to Designing for Positive User Experiences

In the 1980s and 1990s, the first two generations or “waves” of HCI [8] focused on effective and efficient task completion [29]. From a human-centered perspective, users (at this stage, mostly workers) were to be satisfied with the working of their computerized tools. The fit between system and user was assessed in terms of usability [94, 114] — the degree of effectiveness, efficiency, and satisfaction with which a user completes their tasks in a system [52]. This means that researchers concentrated on preventing frustration and dissatisfaction [46], and equated the absence of problems in the interaction between system and user with successful design [46].

At the turn of the century, as interactive applications spread into the private sphere, researchers within the HCI community started to shift their focus from the usability of interactive artifacts to the experiences these artifacts evoked in their users [8, 14]. Consequently, the concept of user experience (UX) came to form the core of the third wave of HCI [8].

4.2.1 Understanding (User) Experience

UX refers to the experience that emerges from encountering one or more interactive products [44]. As UX is a subset of an individual’s experience of life, “its underlying principles [are not] different from experience in general. […] From a designer’s perspective, the distinction is worthwhile, from a recipient’s, consumer’s, or user’s perspective, experience remains experience, no matter whether mediated by an object, a service, or other people” [44, p.2]. To understand UX, one thus needs to understand experience in general.

Fundamentally, experience refers to the “stream of perceptions, interpretations of those perceptions, and resulting emotions” [94, p.7] an individual experiences as they live and interact with their environment [27]. Experience is a two-way process in that it is shaped by both bottom-up (environment — individual) and top-down (individual — environment) processes [27]. In other words, individuals are not passive recipients of external input; on the contrary, what they have previously experienced influences how they perceive, make sense of and react to the world around them [27, 74]. This means that expe-
rience is, in essence, unique to each individual: no two people experience the world in the exact same way [74, 94]. At times, the continuous stream of sensations, sensemaking, and emotions comes to form an experience — a story with a beginning, an end, and a unifying emotional quality [74]; an episode “stored in memory, labeled, relived, and communicated to others” [44, p.8].

The definition above highlights two core elements of experience: cognition (thoughts, sensemaking), and emotions (i.e., short-lived affective responses [7, 24, 31, 67]). Appraisal theories of emotion assert a causal relationship between cognition and emotions. Indeed, they argue that emotions arise from cognitive evaluations — appraisals — of an event’s significance for one’s well-being. Essentially, “we can think of an appraisal as an answer to the question, ‘What does this situation mean for my well-being?’ If the answer given to this question is positive (beneficial to my well-being), a pleasant emotion occurs. In contrast, a negative answer (harmful to my well-being) evokes an unpleasant emotion” [23, p.42]. However, appraisals are best understood “in terms of several questions, each focusing on a different aspect of the situation: ‘How does this situation relate to my motives?’, ‘To what extent was this situation expected?’, ‘Who or what is responsible for this situation?’, among others” [23, p.42]. The answers to each question come to form a specific appraisal pattern, and this pattern can then be associated with a specific emotion [23]. For example, frustration is associated with appraisals of 1) being hindered in the accomplishment of a goal and, 2) there being no clear candidate to blame [33]. In contrast, when a perceived hindrance to accomplishing a goal can be blamed on something or someone, the associated emotion is anger [33]. This example shows how different answers to the question “who or what is responsible for this situation?” result in different appraisal patterns and, therefore, different emotions. It is important to specify that appraisal theories “assume that there is a variable relation between stimuli and emotions, but a stable relation between appraisals and emotions. In general, the same appraisals lead to the same emotions; different appraisals lead to different emotions” [81, p.121]. Therefore, if two people experience different emotions when confronted with the same situation (e.g., a paper jam in the printer), appraisal theory assumes that it is not because they react differently to the same appraisal, but rather because they evaluate the situation differently (i.e., develop different appraisal patterns). This stable relation between appraisals and emotions implies that one can identify specific, discrete emotions (e.g., joy, pride, sadness, or anger) through the appraisal patterns with which they are associated.

As mentioned above, user experience refers to individuals’ experience of technology — the experience and experiences that emerge in connection with the use of one or more interactive systems [94, 44]. UX emerges from the interplay between user, (interactive) system(s), and situation (context) [74, 94, 119]. A central assumption in the UX field is that personal experience can be manipulated through the technology [37] — that we can design for particular experiences [114, 44, 45]. Although designers cannot control the
way individuals process their experience(s) connected with the use of a system (or systems), they can endeavour to design the conditions for particular experience(s) [114]. In the same way as filmmakers can combine image and sound elements to produce certain effects on the spectator, like for example thrill or amusement, designers of interactive systems can manipulate system appearance, content and functionality to foster (though never guarantee) the emergence of particular experiential patterns, such as specific emotions [44].

4.2.2 (User) Experience and Well-Being

Emotions are important as they constitute the link between (user) experience and well-being [45]. Indeed, “the experience of positive emotions generally promotes well-being and other desirable outcomes, while the excessive experience of negative emotions is associated with undesirable outcomes” [50, p.902], including impaired mental health. Thus, “experiencing relatively high levels of positive and relatively low levels of negative emotions (within boundaries) constitutes a key aspect of mental health” [50, p.902]. Incidentally, negative emotions felt at work have been associated with nurse burnout [107]. That being said, it is important to stress that negative emotions are not always detrimental to well-being. In fact, Fokkinga has argued that “rich” experiences can comprise both positive and negative emotions. For instance, working one’s way through a series of obstacles (and the associated frustration) can lead to heightened satisfaction once the goal is finally reached [34]. Furthermore, it is important to highlight that there is more to well-being than (positive or negative) emotions [14]; for example, a more general assessment of life as positive and meaningful [45]. Nevertheless, “positive emotions remain critical to theories of well-being and an obvious target for technological design” [14, p.119]. The overall experience of positive emotions can be fostered in two main ways: by reducing negative experiences (i.e., experiences with a negative emotional valence) or by increasing positive experiences (i.e., experiences with a positive emotional valence). People can tell whether an experience has been positive or negative [45].

4.2.3 User Experience-Centered Approaches to Design

The shift to UX in HCI led researchers to elaborate UX-centered design approaches. These approaches aim to design for specific, predefined experiential outcomes [44, 114, 119], also referred to as UX goals [56]. Interestingly, this has led to the (re-)emergence of a humanistic agenda in HCI [114] as several researchers have formulated well-being-driven UX goals, such as human growth [114] and well-being [14, 44, 26, 92], and stressed the “potential for technology to enhance and transform people’s lives” [114, p.4].
Some of the UX-centered and well-being-driven design approaches that have emerged include experience-centered design [114], experience design [44], positive design [26], design for positive emotions [119], positive technology [92], and positive computing [14]. These approaches present different ways to foster human flourishing through the design of interactive artifacts. Nevertheless, all of them but one (experience-centered design, which formulates much broader UX goals, such as emotional growth [114]) address positive emotions. Experience design [44] introduces an indirect approach to designing for positive affect (i.e., unspecified positive emotions) that uses core psychological needs (e.g., autonomy, competence, relatedness, popularity, stimulation, and security [45]) as UX goals. Design for positive emotions [119], positive design [26], positive computing [14], and positive technology [92] all explicitly present positive emotions as UX goals.

Among these different approaches that introduce positive emotions as UX goals, design for positive emotions [119] is the one providing the most guidance on how to understand and identify specific, discrete emotions. Indeed, it is rooted in emotion design research [119], which has, within the last fifteen years, produced various papers [23, 24, 118, 25, 35] and resources [33] to support designers in working with both positive and negative discrete emotions. Emotion design research has also stressed the benefits of identifying and differentiating between different discrete emotions (as opposed to undifferentiated positive and negative affect) in UX research. These benefits include a deeper empathy for users and a higher precision in the formulation of emotional UX goals, which is likely to increase the chances of a design having the intended emotional impact [119].

4.2.4 User Experience-Driven Research in the Workplace

The HCI community has been slow in applying UX-centered, well-being-driven approaches to work settings [93], and research on UX at work is still immature [16]. Only recently have studies emerged that directly or indirectly aim to improve the experience of work through changes in workplace technology and technology-mediated work practices. Some concentrate on understanding the nature of UX at work [21, 49, 77, 111, 115]. Others focus more on defining desirable UX goals for different work settings [19, 20, 56, 59, 61, 71, 123, 70].

There are also studies that seek to improve the experience of work through technology-mediated health or well-being interventions, such as mobile health applications targeted at health care professionals [22, 117]. However, these studies fall beyond the scope of this thesis, which centers on improving the experience of technology-mediated work rather than on health care professionals’ abilities to cope with their stressful working conditions (see Chapter 2).
Studies on work-related UX cover a variety of work domains, including health care and the hospital setting [49, 61, 123, 66]. However, little research exists on the UX and UX goals for physicians or nursing staff in non-acute care units. Furthermore, few studies approach workplace UX through an emotion-focused lens. In fact, in their 2022 review, Çağlar et al. [16] noted that emotions were rarely part of the main discussion in papers on UX at work. This is for example the case in workplace UX studies in health care [49, 61, 123, 66], where some discrete emotions or feelings may be mentioned (e.g., pride [66]) even though the focus is on psychological needs.

Another issue is the way in which emotions are addressed from a methodological perspective. Several workplace UX studies examine emotions in a close-ended way, for example by resorting to the Positive and Negative Affect Schedule [49, 111]. Such a close-ended approach inherently restricts researchers’ abilities to identify the nuanced, discrete emotions users experience as it asks participants to describe their experiences with the help of a predefined list of affective states. Nevertheless, multiple workplace UX studies do examine emotions from an open-ended perspective. For instance, Obrist et al. [86] include a prompt about emotion in the probes they use to ask semiconductor factory workers about their experience of work (even though emotions are not the main research focus). Their and others’ research into UX in the semi-conductor factory setting has found that factory workers experience negative emotions such as anger, fear, and frustration, as well as positive emotions such as joy, fun, and pride [116]. Clemmensen and Barlow [20] examine workplace emotions related to technology use more closely in their study of climate management-related UX. Through a qualitative analysis of their data, they identify a variety of positive and negative emotions, such as pride, enthusiasm, powerlessness, and resentment. However, the authors neither define these emotions nor explain how they identified them. This is in line with Çağlar et al.’s observation that workplace UX researchers rarely devote attention to explaining the meaning of the UX dimensions (here, participants’ discrete emotions) they identify [16].

In summary, the UX emerging from work-related technology use has not been sufficiently studied by the HCI community. This has caused “emotions and experiences around the usage of work tools to fall behind pragmatic considerations, such as efficiency and ease of use” [16, p.123:1]. The current thesis contributes to filling this gap and bringing emotional concerns into the work domain by taking an emotion-focused approach to examining and defining goals for clinicians’ work-related UX. To my knowledge, none of the existing studies on health care professionals’ work-related UX in the hospital setting have focused on identifying and formulating UX goals based on discrete emotions felt at work in connection with work-related IT use.
4.3 The Role of User Involvement in Shaping Usability and User Experience

The involvement of end users in IT design is a central tenet of socio-technical design [48] and design methods within HCI [63]. It is widely assumed that, in order to design a system with positive use outcomes, such as high usability ratings and positive user experiences, end users’ input must be collected and incorporated throughout the development life cycle [63].

The critical importance of end-user involvement has also been stressed in the health IT literature [63, 104, 40, 109]. In addition, several studies have shown that the integration of user feedback in the early stages of health IT design has a positive impact on usability [15]. However, researchers have found that, in many cases, health IT vendors and implementers (i.e., health care organizations, or rather, IT staff members in health care organizations) fail to (sufficiently) involve clinicians, and especially nursing staff, in the design and implementation of health IT [15, 104, 105]. This lack of involvement has been associated with poor health IT usability [15]. For instance, health IT experts have reported that “current [health IT] vendors do not yet understand how to support nurses’ work, their critical thinking, and decision-making” [104, p.192] and have called for nursing staff “to be involved across the systems life cycle from selection to tailoring/customization to implementation, evaluation, and optimization” [104, p.194]. It is important to stress that both health IT vendors and IT implementers need to work on clinician involvement in order for health IT usability and clinicians’ UX to improve. Indeed, health IT implementers make decisions about, among other things, system selection, customization, configuration, and end-user training, all of which affect clinicians’ experience and use of health IT [15]. Therefore, getting user input and aligning IT-related decisions with that input is as important for IT implementers as it is for IT vendors if they want to foster positive user experiences.

In addition to getting clinician input, Staggers et al. [104] also stress the importance of IT implementers providing clinicians with information about health IT, particularly when it comes to system selection. Indeed, they stress that nursing staff “must understand why they are interacting with health IT. Executives can actively make the case about why specific health IT solutions were selected and for what purpose” [104, p.194]. Thus, the existing literature recommends a two-way communication between clinicians and health IT implementers to foster positive health IT outcomes. It also highlights that, in many cases, this two-way communication is deficient, which contributes to the poor usability of health IT and to negative UX for clinicians.

Moreover, the existing literature suggests that both IT implementers and nursing staff may need to adjust their mindsets and practices in order to establish successful two-way communication and a satisfactory level of user involvement surrounding health IT design and implementation. Nursing staff have been found to be reluctant to take an active role in these health IT pro-
cesses [90]. This has led Procter et al. to stress that “nurses at all levels have a choice, to continue to shy away from involvement in the development, implementation and evaluation of [health IT] systems, or take a leadership role and add [system-related] wisdom to their professional knowledge” [90, p. 24].

These findings point to the need for improving health IT implementers’ communication practices with clinicians and, in particular, nursing staff. However, a challenge is that there is little research on health IT implementers’ work [15]. Therefore, more research is needed on the issues that prevent or undermine two-way communication between nursing staff and IT staff in health care organizations.
5. Research Setting

We conducted our research at a Swedish publicly funded University Hospital (UH) with approximately 850 hospital beds. UH has about 8,600 employees, including 2,500 RNs, 1,970 NAs, and 1,450 physicians. Most clinical and administrative processes at UH are computer-supported. Its IT infrastructure is composed of a variety of commercial off-the-shelf systems that have been developed by different IT vendors. Consequently, these systems are not always interoperable and lack a standardized graphic profile or logic. Each unit uses a different combination of systems, but all units require their staff members to use several systems to fulfill their daily clinical and administrative responsibilities. In addition, different organizational departments are in charge of different systems. Some of the biggest IT systems at UH, including its hospital-wide EHR, its operation planning system, and its patient vitals monitoring system, are managed by an IT staff unit at the county level, called EPJ.

UH’s hospital-wide EHR has been in use for over a decade, although it went through a significant update right before our first data collection. The EHR supports, among other processes, clinical documentation and medication management. The EHR’s medication module includes features such as a medication list and links to the most commonly used website for drug-related information (FASS). It also supports medication ordering with CDS in the form of an interaction module. This module issues various warnings to the ordering physician at the time of ordering, such as drug-drug interactions, contraindications in case of breastfeeding and pregnancy, and duplicate MOs. It is important to specify that, in Swedish hospitals, not all inpatient MOs are checked by pharmacists. At UH, for example, only some wards employ clinical pharmacists. Therefore, most MOs do not pass through the hands of a pharmacist before reaching RNs, who usually dispense and administer them.

Although most of medication management at UH is carried out in the EHR, some parts of the process, including cytostatic MOs and MOs for patients admitted to intensive care units, are managed in additional, separate systems that are only partially integrated with the EHR. This means that, when a patient is transferred from an intensive care unit to a ward, the relevant patient information has to be transferred manually from one system to another. Similarly, if patients receive medications through the national dose-dispensing system (NDDS), physicians must manually transfer medication information between the two systems. However, they can access patients’ NDDS prescriptions through a tab in the medication module in the EHR.
UH staff’s digital environment is in a state of constant evolution: systems are updated, added to, or removed on a regular basis. In-person training is not provided for all systems and for all staff. Video tutorials are available on an in-house e-learning platform. In addition, one RN on each ward is in charge of documentation and receives extra training and information about the EHR.
6. Method

In this method chapter, I first present the ontological and epistemological principles that underlie my research. Next, I set out the ethical guidelines that I have followed in my studies and the measures that I have taken to ensure the ethical integrity of my work. I then describe the data collection and data analysis procedures that I have applied. Finally, I discuss the main quality criteria that I have considered throughout my studies and explain how I have worked to ensure the trustworthiness of my research.

6.1 Ontological and Epistemological Considerations

I have conducted experiential qualitative research [11] from a relativist ontological stance and a subjectivist epistemological standpoint [69]. This means that I have sought to understand my participants’ experiences from their “own perspectives and meanings” [11, p.21] as opposed to considering them through a critical lens and setting them against internal or external values or norms (e.g., clinical guidelines). It also means that my work is not about uncovering an absolute truth — one reality that would be “out there” for me and other researchers to find [11]. As experience is a person-, context-, and time-dependent phenomenon [27, 74], it is the epitome of reality as social and relative. Thus, I understand my findings as “true” to different degrees and in different ways for different people, in different contexts, and at different times. Ultimately, I understand my findings as a subjective interpretation of my participants’ subjective experiences.

I have co-constructed this interpretation together with the other people who, directly or indirectly, have played a role in my studies. These people include, first, my participants — through the data I have collected and the experiences they have shared with me. The people who have played a role in my studies also include the authors whose work I have used in my research. Through their works, these authors have shaped the particular ways in which I have approached and analyzed my participants’ experiences, including my research questions and my analytical framework (see Section 6.4 below). I have also co-constructed my interpretation together with my co-authors who, through their input, have contributed to shaping my understanding of my participants’ stories and of the literature I have read.

I want to stress that the findings or interpretations I present in this thesis are only one way of making sense of and presenting hospital clinicians’ experience of working with IT; another researcher would have told a different
“story,” in a different way [11]. Nevertheless, my interpretation, the “story” I am presenting in this thesis, is grounded in my data. In all my studies, I have taken several steps to ensure the trustworthiness [43, 87], and thus, the scientific quality, of my interpretation (see section 6.5 below).

My research has also had a pragmatic component. Indeed, it has aimed to produce “practical and useful answers that can solve, or at least provide direction in addressing, concrete problems” [87]. In my work, the “concrete problem” is the negative impact of health IT use on clinicians’ well-being. The “practical and useful answers” are the UX goals and other implications for design and practice I present based on my understanding of my participants’ experience of work-related IT use (see the Discussion chapter). Put another way, the primary intention behind my research is to be useful. I have sought to inform action (i.e., the design of health IT systems and practices) to create positive change and foster clinicians’ well-being at work. The underlying assumption here is that, if findings prove to be useful, they can also, at least to a certain extent, be considered “true.”

6.2 Ethical Considerations

All studies involving people as research participants have to follow particular ethical guidelines. For instance, obtaining informed consent from participants prior to data collection is an essential element in ethical qualitative research [11]. A prerequisite for informed consent is providing (potential) participants with complete and honest information about the study, including the potential risks it entails for participants and participants’ rights during and after data collection. Informed consent was obtained for all participants across Studies A—D.

Another ethical aspect I have had to consider in Studies A—C was the potential collection of sensitive personal data — here, data about participants’ mental health. It could, for example, be expected that participants would touch upon burnout. For this reason, it was determined that my studies required approval from the Swedish Ethical Review Authority (SWERA). An application for ethical approval was submitted to SWERA for both research projects (DISA and XWEL). Ethical approval was granted for DISA; the board decided that XWEL did not require ethical approval. In any case, Studies A—C were conducted in accordance with the guidelines provided by SWERA.

6.3 Data Collection

In this section, I first present an overview of the data collection methods and participants across Studies A—C. Then, I describe the data collection proce-
dure for each of these three studies in more detail. Finally, I describe the data collection procedure and participants of Study D.

6.3.1 Overview of Studies A—C

Across Studies A-C, data were collected through six structured interviews, one group interview, five focus groups (FGs), and 16 semi-structured interviews. Participants were RNs (including post-anesthesia care unit (PACU) RNs and RN anesthetists), NAs, and physicians. Table 6.1 presents the role(s), work unit(s), and number of participants as well as the data collection method(s) used in each study. For nursing staff, the work setting (ward or OR) is also specified. Study A (Paper I) is based on data from 31 RNs and NAs, Study B (Papers II and III) on data from 15 RNs, and Study C on data from 10 physicians. Study A and Study B share some data (two focus groups with ward RNs). For Studies A—B, no or few sociodemographic data (i.e., for Study B, participants’ ages) were collected because participants’ characteristics were considered outside of the scope of the study. The overall number of participants across Studies A—C is 47.

The structured interviews were documented through note-taking on paper. All semi-structured interviews and focus groups and the group interview were audio recorded and later transcribed for analysis.

6.3.2 Study A

In Study A, I talked to both NAs and RNs. I first conducted structured interviews at the pediatric OR unit at UH. These first interviews were part of a collaboration with EPJ. They took place about five months after a new operation planning system was deployed, and aimed to assess the staff’s experience of the new system and the deployment process. Participants were recruited by the OR unit’s nurse manager. Convenience played a role in the selection of participants, as they needed to be able to leave their work duties for the duration of the interview. Each interview lasted between ten and fifteen minutes.

Some weeks later, I was able to carry out three observation days at UH — one at the pediatric OR, and two in a pediatric oncology ward. I did not use the data (i.e., observation notes) from these observation days in my studies because they did not fit in with an experience-centered focus. Nevertheless, they did shape my understanding of nursing staff’s work and thus had an influence on Studies A and B.

Approximately nine months after the structured interviews, still as part of my research group’s collaboration with EPJ, I went back to the pediatric OR for a group interview. This interview was aimed at understanding the OR staff’s dissatisfaction with the systems in use during operations, namely the
Table 6.1. Overview of research participants across Studies A-C.

<table>
<thead>
<tr>
<th>Study</th>
<th>Method/Episode</th>
<th>Setting/Ward</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 OR NAs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 OR RNs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 PACU RN</td>
</tr>
<tr>
<td>Study A</td>
<td>Structured</td>
<td>Pediatric OR</td>
<td>2 OR RNs</td>
</tr>
<tr>
<td></td>
<td>interviews</td>
<td></td>
<td>1 RN anesthetist</td>
</tr>
<tr>
<td></td>
<td>Group</td>
<td>Pediatric OR</td>
<td>2 OR RNs</td>
</tr>
<tr>
<td></td>
<td>interview</td>
<td></td>
<td>1 RN anesthetist</td>
</tr>
<tr>
<td></td>
<td>FG1</td>
<td>Surgery</td>
<td>6 NAs</td>
</tr>
<tr>
<td></td>
<td>FG3</td>
<td>Pediatric OR</td>
<td>2 OR NAs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 OR RN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 RN anesthetist</td>
</tr>
<tr>
<td></td>
<td>FG5</td>
<td>Pediatric oncology</td>
<td>1 NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neonatal</td>
<td>1 NA</td>
</tr>
<tr>
<td>Study</td>
<td>FG2</td>
<td>Surgery</td>
<td>6 RNs</td>
</tr>
<tr>
<td>A &amp; FG2</td>
<td>Interviews</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study B</td>
<td>FG4</td>
<td>Pediatric oncology</td>
<td>3 RNs</td>
</tr>
<tr>
<td>Study B</td>
<td>Interviews</td>
<td>Surgery</td>
<td>6 RNs</td>
</tr>
<tr>
<td>Study C</td>
<td>Interviews</td>
<td>Orthopedics ward</td>
<td>1 physician</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Infection diseases</td>
<td>2 physicians</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kidney</td>
<td>2 physicians</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lung</td>
<td>2 physicians</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Internal medicine,</td>
<td>1 physician</td>
</tr>
<tr>
<td></td>
<td></td>
<td>kidney,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>cardiology,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>and psychiatry</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Psychiatry</td>
<td>1 physician</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gastroenterology</td>
<td>1 physician</td>
</tr>
</tbody>
</table>

EHR, the operation planning system, and the newly implemented vitals monitoring system. Participants were recruited by the OR unit’s nurse manager.

At about the same time, my co-supervisor Minna Salminen-Karlsson and I planned and conducted five 90-minute focus groups (FGs) with NAs and RNs in both ward and OR settings. The FGs were aimed at gathering nursing staff’s positive and negative experiences of daily work-related IT use and discussing the consequences of these experiences on their work. FG participants were recruited by one nurse manager and one RN, both members of DISA’s reference group. To the best of their ability, they aimed to sample for diversity, and invited NAs and RNs with different years of experience, different levels of IT knowledge, different attitudes towards IT, and different genders to participate.

The focus groups had a broader scope than the structured and group interviews, and participants were encouraged to bring up experiences with any of the systems they used in their work. Our aim was breadth (i.e., to collect as many different experiences as possible) rather than depth. Minna and I mod-
erated the first two focus groups together, Minna facilitated the third focus group, and I moderated the two last ones.

After these five focus groups, we, from our specific perspective of inquiry, noticed some clear recurring elements across our participants’ stories. We therefore decided to end data collection and move on to the analysis of the data we had collected.

6.3.3 Study B
In Study B, I wanted to examine nursing staff’s experiences in more depth. I therefore decided to conduct one-on-one, semi-structured interviews with members of the nursing staff. As I sought to favor depth rather than a broad scope (as opposed to Study A), I also chose to focus on one single role and setting: ward RNs. Practical considerations played a role in this choice, as ward RNs were more accessible to us than OR staff. I also chose RNs over NAs since RNs are the typical study population for nursing studies, and they are responsible for core nursing tasks, such as medication administration and care coordination. In addition to examining ward RNs’ experiences in more depth, these interviews also aimed to collect additional positive experiences with work-related IT use (if possible — since mostly negative experiences had been collected in Study A).

I encountered important recruitment difficulties during this study. Three participants were recruited by a nurse manager, who applied a purposive sampling strategy (i.e., sought participants who they felt would provide us with rich information) [11]. I recruited the last three participants using a convenience sampling strategy (i.e., asking for volunteers) [11]. The only requirement was for participants to work clinically at least part time.

My co-supervisor Minna Salminen-Karlsson and I were able to conduct three interviews in the spring of 2019. The questions addressed different situations and experiential aspects that ward RNs had brought up in the focus groups previously conducted. Minna carried out one interview, and I two. I then had to halt my attempts at recruiting more participants during the fall of 2019 because I went abroad to visit a research group in Austria. I resumed my efforts in the spring of 2020. By the time the first wave of the Covid pandemic hit, I had managed to conduct three more interviews. The schedule for these three interviews was different from the one used in the first 2019 interviews.

As in the focus groups, participants were asked to come up with any positive or negative experiences they could think of connected with work-related IT use. Follow-up questions then explicitly focused on participants’ thoughts and emotions during the experiences they were recounting. These follow-up questions were based on the experience interview template provided by Zeiner et al. [120], which I used as a note-taking sheet during the interviews. (However, I did not show the sheet to my participants.) In spite of those differences,
all six interviews were fundamentally about my participants’ day-to-day experience of working with IT. Each interview lasted between about 40 minutes and an hour.

The level of saturation I had reached after the six interviews was high enough for my analysis. I found similarities both between each interview and between the interviews and the two previously conducted focus groups with ward RNs.

### 6.3.4 Study C

I carried out ten semi-structured interviews with physicians. Participants were recruited via purposive sampling [11] through members of the project group (a pharmacist and two physicians) working at UH. We sought to recruit physicians from different departments, of different ages and with different levels of experience (i.e., years of experience as a physician and at UH). Due to the Covid pandemic, I conducted all but one interview remotely (via Zoom).

The length of each interview was determined by the participant’s availability and individual factors. The interviews typically lasted between 30 and 60 minutes. I asked participants to recall and share positive and negative work moments involving or connected with electronic MOs. Follow-up questions probed into the participants’ interpretations of and emotions during the recounted episodes. Participants shared similar stories and, after ten interviews, I estimated that I had enough material for the analysis.

### 6.3.5 Study D

Two students conducted a total of 15 semi-structured interviews with IT staff members working at or affiliated with EPJ. Participants worked with the configuration, customization and/or maintenance of one or more IT systems in use at UH. Table 6.2 shows the participants’ roles (the job titles given in the table are those used by the interviewees themselves). The students’ questions centered on interviewees’ perspectives on nursing staff’s involvement in the design and implementation of IT systems at UH and the usability of these systems.

#### Table 6.2. Roles of the IT staff members interviewed in Study D.

<table>
<thead>
<tr>
<th>Role</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Care coordinator</td>
<td>1</td>
</tr>
<tr>
<td>Project leader/manager</td>
<td>5</td>
</tr>
<tr>
<td>Support staff member</td>
<td>4</td>
</tr>
<tr>
<td>IT technician</td>
<td>1</td>
</tr>
<tr>
<td>Application manager</td>
<td>4</td>
</tr>
</tbody>
</table>
6.4 Data Analysis

In all studies in this thesis, data analysis was based on Braun and Clarke’s version of thematic analysis [11]. For Studies A-C, other influences include Graneheim and Lundman’s paper on qualitative content analysis in nursing research [43], Saldaña’s *Coding Manual for Qualitative Researchers* [96], and Patton’s *Qualitative Research and Evaluation Methods* [87].

In the following sections, I describe in more detail the analytical procedure for each study. Study B (Papers II and III) and Study C (Paper IV) use a similar, UX-centered and emotion-focused analytical framework and the analytical procedures for these two studies are therefore presented jointly in Section 6.4.2. For detailed descriptions of each analytical procedure, I refer the reader to the papers.

6.4.1 Study A

The first step in my analysis was to identify and select all the segments across the data set in which participants mentioned a task or part of a task being left undone at the end of their shift. Only mentions of concrete tasks undone at the end of the shift were included. Tasks whose execution was delayed but that were still carried out during the shift were excluded. I discussed these selection criteria with my second author.

The second step in my analysis was to code the selected segments. I coded the speaker’s role (RN or NA) and the task that was left undone. Next, I assigned these tasks to one of two categories: IT-supported tasks and non-IT-supported tasks (i.e., tasks that were not mediated by IT). I then coded the focus of the different tasks based on what the tasks were about (e.g., patient care, work environment). Next, I shifted my focus to the antecedents to which participants attributed the identified tasks remaining undone at the end of their shift. I coded these antecedents and then grouped them into categories. Finally, I assigned each of these categories to one of two classes: IT-related or non-IT-related.

6.4.2 Studies B and C

I put together a particular coding framework to analyze my data from a UX-centered and emotion-focused perspective. I focused on appraisals, emotions, and the connection between these appraisals and emotions. At least two rounds of coding were conducted for appraisals and emotions; connections between the two were coded last.

In Study B, I used mainly researcher-driven, process codes (i.e., codes comprising a verb in gerundive form) to code appraisals. The idea was to remain close to the notion of experience as something ongoing. The question that guided the appraisal-coding process was: “from the participant’s perspective,
what is happening here?” Since appraisal codes in Study A were researcher-driven, I also used in-vivo codes as reference points throughout the coding process to avoid losing the connection with the data.

In Study C, I switched to data-driven codes for appraisals. The question that guided the coding process was: “what is the participant telling themselves?” These data-driven appraisal codes were consolidated appraisals in the sense that they were formulated on the basis of multiple participant statements.

To code emotions, I used both in-vivo codes and emotion codes (i.e., emotion terms) throughout Studies B and C. To guide me in the selection of appropriate emotion codes, I primarily used Fokkinga’s online emotion typology [33], Yoon et al.’s embodied typology of positive emotions [118] and Desmet’s paper on 25 Positive Emotions in Human-Product Interactions [24]. In cases where I did not find an emotion term that I felt matched my existing in-vivo and emotion codes in those sources, I referred to the online Merriam Webster dictionary (https://www.merriam-webster.com/) or other research papers [41, 89]. Table 6.3 presents the definitions I have used for each of the emotions I mention in this CS.

Finally, the connection(s) between appraisals and emotions were coded using causation coding as described by Saldaña [96]. The aim of this stage of the analysis was to identify patterns in the connections between appraisals (what appraisals were antecedents to other appraisals) and between appraisals and emotions (i.e., what appraisals resulted in what emotion(s)). Figure 6.1 shows an example of the final coding (including in-vivo coding, appraisal coding, emotion coding, and connection coding) of one of the segments in my data (for clarity, I have translated the segment from Swedish to English, although the coding was conducted using the original Swedish transcripts of my data).

![Figure 6.1. Example of the final coding of one of the segments in my data.](image-url)
Table 6.3. Definitions of the emotions mentioned in Papers I-IV and in this comprehensive summary (CS). The last column on the right indicates in which paper(s) the emotion is mentioned. The two last emotions are only mentioned in this CS.

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Definition (i.e., associated appraisal(s))</th>
<th>Paper(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frustration</td>
<td>“Something [gets in] the way of achieving what you want” [33]</td>
<td>Papers II, IV</td>
</tr>
<tr>
<td>Perplexity</td>
<td>“Filled with uncertainty” [79]</td>
<td>Paper II</td>
</tr>
<tr>
<td>Confusion</td>
<td>“You receive information that you cannot match with what you already know” [33]</td>
<td>Paper IV</td>
</tr>
<tr>
<td>Anxiety</td>
<td>“You feel threatened, but you are uncertain of what or how” [33]</td>
<td>Papers II, IV</td>
</tr>
<tr>
<td>Moral distress</td>
<td>Having a troubled conscience due to being unable to “provide the good care [you] want to, yet believe is [your] duty to give” [41]</td>
<td>Paper II</td>
</tr>
<tr>
<td>Alienation</td>
<td>“Feeling withdrawn or separated from others” [78]</td>
<td>Paper II</td>
</tr>
<tr>
<td>Psychological distress</td>
<td>A sense of overload evoked by a present, bad situation [33]</td>
<td>Paper II</td>
</tr>
<tr>
<td>Joy</td>
<td>“Something that facilitates goal accomplishment happens” [118]</td>
<td>Papers III, IV</td>
</tr>
<tr>
<td>Relaxation</td>
<td>“It is certain that an undesirable event will not occur in any way” [118]</td>
<td>Papers II, IV</td>
</tr>
<tr>
<td>Relief</td>
<td>Certainty of “an undesirable situation [having] gone away or changed into a better situation” [118]</td>
<td>Paper III</td>
</tr>
<tr>
<td>Confidence</td>
<td>“It is certain that one is capable of overcoming a challenge in the process of realizing [one’s] goal” [118]</td>
<td>Papers II, IV</td>
</tr>
<tr>
<td>Pride</td>
<td>“One’s praiseworthy behavior surpasses internal or external standard” [118]</td>
<td>CS</td>
</tr>
<tr>
<td>Gratitude</td>
<td>“You think that someone has gone out of their way to do something good or nice for you” [33]</td>
<td>CS</td>
</tr>
</tbody>
</table>
In Study C (Paper IV), I took my analysis one step further and mapped the identified positive and negative experiences (the identified appraisals and their associated emotions) to positive UX goals. Each goal comprises an emotion and an appraisal; each appraisal is formulated from an end-user perspective, that is, in the first person singular, since it refers to a (targeted) subjective experiential outcome. The formulation of each goal was developed iteratively through discussions between the authors.

6.4.3 Study D

Both students used Braun and Clarke’s [11] version of thematic analysis to analyze their data. To write Paper V, I used their findings — including the participant quotes they provided — to identify new themes and bring them into a new, coherent structure.

6.4.4 Comprehensive Summary

To write Sections 7.1 and 7.2 of the Findings chapter in this CS (see below), I collated and further developed the findings from Studies A—C (i.e., Papers I—IV). The following paragraphs describe the process I followed for each of these two sections.

Section 7.1 presents the emotions I identified across hospital clinicians’ stories throughout Studies A—C. To write this section, I started by extracting all the appraisals I had identified across Papers I—IV. Next, I adjusted, where needed, the formulation of these appraisals to ensure they were all in the gerundive form (e.g., “some tasks feel time-consuming and cumbersome” from Paper IV was reformulated as “tasks being unnecessarily cumbersome and time-consuming” in Section 7.1). This formulation in the gerundive form was similar to that used in Paper II (i.e., Study B — see Section 6.4.2). I then grouped the different appraisals based on their similarity, merging appraisals that were close in their meanings into a single, more general appraisal. For example, RNs’ appraisal of mental effort (Paper II) and physicians’ appraisal of vigilance and double-checking being required when manipulating MO values (Paper IV) were merged together under the more general appraisal of “investing an unnecessary amount of concentration into a task” (see Section 7.1). Finally, I matched the resulting appraisals with their associated emotion, following the same procedure as in Studies B and C (see Section 6.4.2).

I defined UX goals through an iterative process of mapping the positive and negative appraisals and their emotions identified through my previous analysis to positive target appraisals. The question that led the mapping and goal formulation process was: “what is the positive appraisal that we should aspire to foster in clinicians?” When both positive and negative appraisals were available, the positive appraisals and emotions were used as a point of departure
to formulate the positive UX goal. When only negative appraisals were available, the positive UX goal was defined by “reversing” the negative appraisals — with close attention to the specific meaning of each appraisal. Finally, the defined target appraisals were matched with their associated emotion based on Yoon et al.’s [118] and Fokkinga’s [33] emotion definitions (i.e., appraisal patterns). As in Paper IV, the UX goals presented in this CS each comprise an emotion and an appraisal and all appraisals are formulated in the first person singular.

6.5 Quality Considerations
To strengthen the trustworthiness of my findings, I have worked with three concepts: credibility, dependability, and transferability [43]. I explain below, in Sections 6.5.1—6.5.3, how I understand each concept and how I have taken them into consideration in my research.

6.5.1 Credibility
Credibility as a quality criterion refers to the “confidence in how well data and processes of analysis address the intended focus” [43]. The corresponding criterion in quantitative research is internal validity [87].

To support readers in assessing the credibility of my work, I have explained my data collection and analysis procedures in detail. In addition, I provide multiple quotes from different participants to allow the reader to understand my interpretation of the data. I also explain the reasoning behind some of my interpretations (e.g., behind the associations of the identified appraisals with discrete emotions). Where needed, I additionally clarify distinctions between different categories (appraisals, emotions, goals) in my findings.

When conducting my analysis, in-vivo codes have played an important role in ensuring the credibility of my findings. Indeed, by bringing me back to the story as told by the participant(s), these in-vivo codes helped me avoid “losing myself” in my own interpretation.

6.5.2 Dependability
Dependability is about consistency, or systematically following a systematic process [87]. Consistency is important during both data collection and analysis [43].

In qualitative research, changes during data collection are part of the process. Indeed, “interviewing […] is an evolving process during which interviewers […] acquire new insights into the phenomenon of study that can subsequently influence follow-up questions” [43, p.110]. Thus, my aim throughout my data collection was not to achieve absolute consistency, but rather to
maintain a focus on the core RQ I wanted to answer — about the nature of participants’ experience of working with IT. This main RQ provided a common thread to all the interviews and focus groups I conducted.

During data analysis, inconsistencies can, for example, arise when one single code is used to label segments with different meanings. In my first analyses, I worked with a codebook to avoid this issue; later, I started writing about codes and their potential multiple meanings in my analytical memos [96]. Memo writing has been my main tool to foster reflexivity [87] and consistency (i.e., dependability) throughout my analytical work. Using clear definitions of discrete emotions has also contributed to the consistency of my analyses. Indeed, these definitions provided me with certain boundaries that helped me to avoid conflating distinct experiences and concepts.

6.5.3 Transferability
Transferability refers to the extent to which the findings are applicable to, or valid for, other settings or groups [43].

To support readers in assessing the transferability of my findings to their own specific settings, I have provided a detailed description of my research setting (see Chapter 5), including the distinction between RNs and NAs in Sweden (see Section 2.1). When describing my method and my participants (see Chapter 6), I have also provided information about my participants’ work settings (e.g., ward or OR, oncology or surgery).
7. Findings

In Section 7.1, I first present the emotions I have identified across the nursing staff’s and physicians’ positive and negative stories (RQ 1). On this basis, I formulate UX goals for hospital clinicians’ work-related IT use (RQ 2) in Section 7.2. Finally, in Section 7.3, I present the breakdowns, which, from the IT staff’s perspective, occur in the communication between IT staff and nursing staff (RQ 3).

7.1 Emotions that Hospital Nursing Staff and Physicians Experience in Connection With Their Work-Related Information Technology Use

Papers I—IV present a variety of appraisals that nursing staff and physicians can experience in connection with work-related IT use. In accordance with appraisal theories of emotion (see Sections 4.2.1 and 6.4.2), I have associated these appraisals with discrete positive and negative emotions. Thus, the appraisals that I have identified across my participants’ stories have been the means of associating these stories with specific emotions — and of answering my first RQ about the discrete emotions that work-related IT use evokes in hospital nursing staff and physicians. Tables 7.1 and 7.2 below provide an overview of the different appraisals and negative and positive emotions identified across Papers I—Iv and the role(s) to which they were attached. In addition, the tables indicate the paper(s) in which each emotion and/or appraisal is mentioned. Each emotion and appraisal are described in more detail in Sections 7.1.1 — 7.1.10.

7.1.1 Frustration

Frustration refers to “negative agitation” arising when “one’s path towards achieving a goal is blocked” [33]. I have associated frustration with four of the appraisals I have identified across my participants’ stories.

The first appraisal I have associated with frustration is being unable to complete a task. Indeed, both physicians and ward RNs and NAs reported being, at times, unable to complete an IT-supported task. The antecedents of this inability could be social (e.g., physicians not having created an MO), technical (e.g., the system freezing or crashing, being kicked out of the system),
Table 7.1. Negative emotions and appraisals identified across Papers I, II, IV

<table>
<thead>
<tr>
<th>Emotions</th>
<th>Appraisals</th>
<th>Role(s)</th>
<th>Paper(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frustration</td>
<td>Being unable to complete a task</td>
<td>Ward RN &amp; NA Physician</td>
<td>I, II</td>
</tr>
<tr>
<td></td>
<td>Tasks being unnecessarily cumbersome and time-consuming</td>
<td>Ward RN &amp; NA OR RN &amp; NA Physician</td>
<td>I, II, IV</td>
</tr>
<tr>
<td></td>
<td>Investing an unnecessary amount of concentration into a task</td>
<td>Ward RN Physician</td>
<td>II, IV</td>
</tr>
<tr>
<td></td>
<td>Failing to complete a task</td>
<td>Ward RN Physician</td>
<td>II, IV</td>
</tr>
<tr>
<td>Perplexity</td>
<td>Not knowing or understanding what to do</td>
<td>Ward RN &amp; NA Physician</td>
<td>I, II</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Errors being possible</td>
<td>Ward RN Physician</td>
<td>II, IV</td>
</tr>
<tr>
<td>Moral distress</td>
<td>Working in a way that falls short of best practices</td>
<td>OR RN &amp; NA Ward RN &amp; NA</td>
<td>I, I, II</td>
</tr>
<tr>
<td>Alienation</td>
<td>Others’ actions or inaction being responsible for excessive work demands</td>
<td>Ward RN</td>
<td>II</td>
</tr>
<tr>
<td>Psychological distress</td>
<td>Being pushed to the limits of what one can handle</td>
<td>OR RN Ward RN</td>
<td>I, II</td>
</tr>
</tbody>
</table>

Table 7.2. Positive emotions and appraisals identified across Papers III—IV

<table>
<thead>
<tr>
<th>Emotions</th>
<th>Appraisals</th>
<th>Role(s)</th>
<th>Paper(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joy</td>
<td>Tasks being easy and quick to complete</td>
<td>Ward RN Physician</td>
<td>III, IV</td>
</tr>
<tr>
<td>Relaxation</td>
<td>Risk of error being reduced</td>
<td>Ward RN Physician</td>
<td>III, IV</td>
</tr>
<tr>
<td></td>
<td>Access to clinical information being assured</td>
<td>Ward RN</td>
<td>III</td>
</tr>
<tr>
<td>Relief</td>
<td>Doing less of a strenuous task</td>
<td>Ward RN</td>
<td>III</td>
</tr>
<tr>
<td>Confidence</td>
<td>Knowing what to do and how to do it</td>
<td>Ward RN</td>
<td>III</td>
</tr>
</tbody>
</table>

functional (e.g., not being able to move a patient from another unit to one’s own), or knowledge-related (i.e., the clinician not knowing how to carry out the intended task; see Section 7.1.2).

“I’ve also seen now a patient who got Sendoxan... But this infusion has been ongoing since 2018. It’s not possible to remove it.”

Physician (P15)
In some cases, this inability to complete a task was surmountable, and clinicians were only temporarily unable to carry on with their work. Clinicians had different ways to overcome these blocks, including troubleshooting (e.g., restarting) the system, calling IT support or a co-worker, and asking colleagues standing nearby for help. In other cases, however, clinicians did not have the means to overcome a block, and the task was left undone (see Section 7.1.4).

The second appraisal I have associated with frustration is tasks being unnecessarily cumbersome and time-consuming. In their negative stories, all roles—ward RNs and NAs, OR RNs and NAs, and physicians—described task flows that were, in their eyes, unnecessarily cumbersome and time-consuming. For instance, task flows could require a number of clicks or steps that participants felt was unnecessary.

“Now you need like 14 clicks to enter a blood sugar and then it disappears into the system. If you later want to see how it went compared to others, you need 14 additional clicks to get to it.”

Ward NA (FG1)

Additionally, overcoming blocks (see above) often required extra work—typically some form of troubleshooting, such as restarting the system, which could also take (unnecessary) time. Additionally, slow system response could add to the time required to complete tasks in the system. Thus, extra and unnecessary steps and slow system response all contributed to making IT-supported tasks cumbersome and time-consuming—in participants’ eyes, more cumbersome and time-consuming than what they could and should be.

The third appraisal I associated with frustration is investing an unnecessary amount of concentration into a task. In their negative stories, ward RNs and physicians indicated needing to concentrate more than they felt should be necessary to carry out some tasks. For ward RNs, working in different systems with different functionalities and logics, remembering multiple passwords, recalling exact names, and learning how to use new systems all added cognitive demands to their work. As for physicians, they felt they needed to be extra attentive when entering or modifying MO values to avoid mistakes.

“Something that can be tricky sometimes is above all when there are pre-filled units. If you aren’t vigilant, there can be problems. For example, you want to have milligrams and it turns out to be milliliters. And vice versa. There can be problems if you aren’t vigilant.”

Physician (P7)

Finally, the fourth appraisal I have associated with frustration is failing to complete a task. Both ward RNs and physicians shared stories of carrying out the steps that (they thought) were required to complete a task and failing to obtain the expected outcome. For example, physicians reported failing to create certain MOs and, in some cases, failing to get a full picture of a patient’s
medication history. As for ward RNs, they indicated failing to find information and documents.

“Other wards maybe work in a different way. And it may work fine for them, but it is really troublesome if you are used to reading in a certain way, and the information is not where you are used to finding it, where you usually find it.”
Ward RN (P5)

The four appraisals mentioned above — being unable to complete a task, tasks being unnecessarily cumbersome and time-consuming, investing an unnecessary amount of concentration into a task, and failing to complete a task — describe different ways in which clinicians are hindered in their IT-related work: either they cannot complete a task successfully, or they have to invest additional effort or time to successfully complete it. In both cases, the path towards goal completion is not straightforward, making goal achievement (i.e., task completion) more difficult — if even possible at all.

7.1.2 Perplexity
In the Merriam Webster dictionary, perplexed is defined as “filled with uncertainty.” I have associated perplexity with one of the appraisals I have identified across participants’ stories: not knowing or understanding what to do. Indeed, both not knowing and not understanding — not managing to make sense of, being confused — can be associated with uncertainty [33, 89]. Therefore, I use perplexity to describe the emotional state that results from being uncertain, due to either a lack of knowledge or to a lack of understanding (i.e., confusion [33]).

Ward RNs, ward NAs, and physicians reported not knowing or understanding what to do in several of their negative stories. For example, they could be unsure about how to complete a task in the system.

“We’ve had huge problems with patients coming from other hospitals. Some of our patients come from other hospitals, like Sundsvall for example, because their status has worsened. So they come with the helicopter, and they come directly to me, they don’t go to the emergency department. In those situations, I want help to register them into [the EHR], because I cannot. I am not a secretary who knows how to do this kind of things.”
Ward RN (P2)

They could also not know how to react to a specific system event (e.g., a comment field popping up), and be unsure about patient status.

“Often, the list of medications in the patient’s clinical notes doesn’t correspond to the list of medications in the medication module. You understand that the physician may have taken the decision of giving them one dose, but it’s not in
list in the medication module and then you wonder, ‘what applies here - is it the medication list in the medication module or what [the physician] wrote in the notes?’”
Physician (P18)

In addition, ward RNs could be uncertain about what care to provide to a patient. Antecedents of nursing staff’s lack of knowledge about patient care included failing to find the needed information or getting a complete overview of the patient, being shown contradictory information in the system, or information not being in the system (e.g., the physician not having specified certain aspects of the treatment).

7.1.3 Anxiety
Fokkinga [33] defines anxiety as “being on guard” due to the perception of an undefined threat. I have associated anxiety with the identified appraisal errors being possible. In their negative stories, both ward RNs and physicians mentioned that mistakes could be made. These mistakes could happen to them or to others. For example, some ward RNs mentioned a risk of less-experienced RNs making mistakes, and some physicians were concerned about ward RNs making mistakes.

“There are different routines in different wards. It can be really hard to create [an MO] that feels completely safe for the patient. It feels like there is always a risk of [the MO] being overlooked. That there is a risk that the MO gets misunderstood or that it doesn’t get administered like it was intended to be.”
Physician (P8)

Moreover, participants mentioned different types of mistakes. Physicians were concerned about missing a relevant interaction warning or a mistake in an MO, and about prescribing an inadequate treatment. Ward RNs expressed concern about missing, misinterpreting, losing, or distorting information.

“When you go into the administration view, the medications are listed according to the administration times. But the times move a bit. There aren’t really any lines. They move around a bit. So it can be easy to miss what time [medications] are supposed to be given.”
Ward RN (P4)

On this basis, I consider the possible occurrence of errors to be an undefined threat in the sense that clinicians do not know if an error will happen or whether it will lead to a clinical incident or have any negative effect on a patient and their treatment — they only know there is a possibility of something bad happening, at some point. In addition, although none of the participants explicitly mentioned feeling anxiety, some interviewees (especially
physicians) did explain being vigilant (see Section 7.1.1). This vigilance can be associated with the notion of “being on guard” mentioned by Fokkinga [33].

7.1.4 Moral Distress

Moral distress or “stress of conscience” [41] is the experience of having a troubled conscience. For health care professionals, moral distress has been associated with being unable to “provide the good care they want to, yet believe is their duty to give” [41, p.249] or, put another way, being prevented from doing what they think is best for the patient. On this basis, I have associated moral distress with the identified appraisal working in a way that falls short of best practices. Indeed, in some of their negative stories, nursing staff — ward RNs and NAs, OR RNs and NAs — described their work as falling short of best practices. Across their stories, I identified two different scenarios. The first is abbreviating or postponing a task. For instance, nursing staff could skip some parts of the record when reading up on their patients or keep documentation brief, and document care at the end of their shift instead (after the next shift was already on the floor).

“If you have something to do, you push documentation to the side until later, and you do it after the end of your shift. And so you can go around and be stressed because ‘I haven’t written anything and now the evening staff is coming’, and [the record] looks completely empty.”
Ward NA (FG1)

The second scenario is leaving a task undone. In Paper I, I took a closer look at the IT-related tasks that nursing staff — both RNs and NAs — can leave undone. I sorted these IT-related tasks left undone into three categories, namely IT-supported tasks about patient care, IT-supported tasks about the work environment, and non-IT-supported tasks about IT.

Of course, nursing staff also mentioned non-IT-supported tasks about patient care being left undone.

“[I feel] a little stressed and a bit like I am a bad nurse who doesn’t have the time to look at my patient.”
OR RN (group interview)

Tasks could be left undone for a variety of reasons. For instance, nursing staff could simply not have time to complete them, which means that they prioritized other tasks they felt were more important or urgent. In fact, nursing staff indicated actively avoiding certain IT-supported tasks to avoid wasting time, since many of these tasks were cumbersome and time-consuming (see Section 7.1.1). Tasks could also be left undone because nursing staff were
unable to do them (see section 7.1.1). Thus, it is important to understand that leaving a task undone was not always a choice (albeit forced by circumstances) on the nursing staff’s part.

The core notion across those stories — which relates the appraisal working in a way that falls short of best practices to moral distress — is that of not doing enough or, at least, not as well as one would like to. Be it through abbreviating, postponing, or leaving tasks undone, nursing staff felt they were doing their job less well than what would be ideal, which left them feeling conflicted, especially if they felt that, to some extent, their behavior compromised patient safety.

7.1.5 Alienation

The Merriam Webster dictionary defines alienated as “feeling withdrawn or separated from others” [78]. I have therefore associated alienation with the identified appraisal others’ actions or inaction being responsible for excessive work demands. In several of their negative stories, ward RNs attributed the occurrence of the — from their perspective — negative event to the actions or inaction of others. These “others” can be sorted into two different groups. The first of these is RNs’ direct co-workers on the floor, especially NAs and physicians. More specifically, RNs felt that NAs and physicians did not contribute to the documentation of patient care as much as they were actually able to. Moreover, some of the participants’ stories described how physicians could (over-)rely on RNs to carry out a task that they were actually responsible for, such as entering a medication order into the system.

“We sit down and enter telephone MOs when the physician has given [us] the order orally... It goes against everything, our being expected to do physicians’ jobs.”
Ward RN (FG4)

The second group is management (i.e., decision-makers in matters related to IT systems and their use). Participants talked about not understanding some of management’s decisions concerning changes to some of their IT systems and about their concerns being ignored by management. In addition to not understanding some of management’s decisions regarding the design of IT systems, ward RNs could also question the division of labor — why just they were required to do certain tasks, which, in their eyes, did not require their specific nursing competence.

“Patients fill in this booklet when they come in, what they’ve had for diseases and such. Then I need to sit down and enter it into the record. I’ve said this, I don’t think an [RN] needs to do it. An NA could do it. Because it has nothing to do with my competence [as an RN].”
Ward RN (P2)
The central aspect here is the sense of disconnect from others, which is at the root of alienation. RNs felt disconnected from NAs, physicians, and IT managers (and IT staff members) in the sense that they perceived these groups to be insensitive and even contributors to the high demands placed on RNs — by not contributing to the work to the best of their ability, or by introducing features or workflows that impeded RNs in their work.

7.1.6 Psychological Distress

Fokkinga [33] associates (psychological) distress with a sense of overload evoked by a present, bad situation. On this basis, I have associated psychological distress with the identified appraisal being pushed to the limits of what one can handle. In some of their negative stories, ward and OR RNs described how they had to complete IT-related tasks they actually did not have the resources — in terms of time of knowledge — to complete. In those cases, there could be a sense of the work demands becoming too much. For instance, documentation could take more time than was allocated to it and dealing with technical issues could require knowledge and understanding RNs did not have, leaving them to feel out of their depth.

“I didn’t get any training, nothing. So to sit there and explain to IT what I have problems with, it’s like speaking Greek.”

Ward RN (FG4)

Furthermore, ward and OR RNs also stressed that, as they worked with multiple systems and patients every day, hindrances piled up, turning a seemingly insignificant hurdle, such as few extra clicks in one system, into a strain-inducing burden.

“The computer technician who does these systems, […] he doesn’t need to log in and out of three different computers, and to log in to three—four different systems all the time. And we are forced to do it, and on time, because we have a life and a child who is lying there, crying, or a patient who is lying somewhere and who I need to take care of now.”

OR RN (FG3)

From a global perspective, several participants agreed that the safe provision of care currently depended on their overexerting themselves. The key notion here is overload — the sense that the situation is (or is close to becoming) — too much to handle.

7.1.7 Joy

Desmet [24, p.4] describes joy as the “experience of being pleased about (or taking pleasure in) something or some desirable event,” and Yoon et al. [118,
p.1197] associate it with the general appraisal *something facilitating goal accomplishment*. Thus, I have associated joy with the identified appraisal *tasks being easy and quick to complete*. In their positive stories, both ward RNs and physicians talked about tasks that were easy, and often also quick, to complete. For instance, many of the ward RNs’ stories centered on their ability to access patient information conveniently.

“It’s really easy to find. Because in [the EHR], there are the welfare officer’s notes, the dietitian’s notes, the physician’s notes, the nurse’s notes... It is in general very easy to find each other’s notes because there are tabs for them.”
Ward RN (P4)

Other stories highlighted how certain IT features, by providing ward RNs with cognitive support, facilitated such clinical tasks as medication administration and checking on patients.

“The list we use to administer medications is good. It’s very clear what we need to give, and when we need to give it. You see for example if you need to give something intravenously, because then there is a picture of a needle. If you need to give a tablet, there is a picture of a tablet. It makes it very clear what you need to give.”
Ward RN (P5)

Physicians’ positive experiences of working with electronic MOs also highlight convenient access to information. For example, they could quickly access a patient’s prescriptions in the NDDS (via a tab in the EHR) and FASS. In addition, physicians also appreciated shortcut features — MO templates, shorthand notations — that made some tasks, such as ordering a common medication or a short de-escalation schedule, quick to complete.

“[Templates] save time. It becomes easier. [...] The work flows in a better way. It’s not a moment that hinders you. On the contrary, you can quickly do what you need to do [in the EHR].”
Physician (P13)

The significant aspects across those stories are ease and effortlessness. In a sense, joy can here be seen as the opposite of frustration: while frustration is associated with experiences of hindrance, joy is associated with an appraisal of smooth task completion.

7.1.8 Relaxation
According to Desmet [24, p.4], relaxation is “a calm state of being, free from mental or physical tension or concern.” It arises when there is a certainty that “an undesirable event will not occur in any way.” [118, p.1197] On this basis,
I have associated relaxation with two of the appraisals I have identified across participants’ positive stories.

The first appraisal is risk of error being reduced. Indeed, a prominent theme across both ward RNs’ and physicians’ positive stories was a sense of increased patient safety stemming from a perceived lower risk of errors — on their own or another’s part. Ward RNs appreciated such IT features as care plans structured like checklists and medication-related warnings because they felt they made it impossible for them to forget or miss any important aspect of patient care.

“In the medication list, it turns red when you have missed something. And this is very good. Maybe you get in to look at something else and ‘oh, I have forgotten to give this’ or ‘I have forgotten this infusion.’ You see it at once. It is red and at the top of the list. So I think that that’s very good.”
Ward RN (P2)

As for the physicians, they stressed the benefits of features such as MO templates and interaction warnings for patient safety — and their own peace of mind — when ordering medication.

“Even if you happen to click on the wrong template, it doesn’t end up being something completely crazy. […] Perhaps it wasn’t fully right in this case, but it isn’t a toxic dose. So [templates] provide a certain safety protection. All available templates are in some way adequate doses.”
Physician (P8)

The second appraisal I have associated with relaxation is assured access to patient information. Some ward RNs placed the ability of accessing any digitally recorded patient information, no matter how old, at the core of their positive stories. They stressed that digital information, unlike paper-based documents, could not get lost or become unavailable. Consequently, they felt that their access to that information was guaranteed whenever they should need it.

“What’s good about all the computerized systems is that you can go back and see, ‘what did I write a very, very long time ago?,’ for example. It’s always there. You don’t need to, like, get paper scanned in any way or go to some kind of collective archive. So [IT] definitely has a meaningfulness in that [the information] is always preserved and, all things considered, quite easy to retrieve.”
Ward RN (P1)

Some participants’ positive stories also addressed guaranteed access to a computer. Both appraisals — risk of error being reduced and access to clinical information being assured — hint at the non-occurrence of an undesirable event. For the appraisal risk of error being reduced, this undesirable event is
an error and, by extension, a clinical incident; for the appraisal assured access to patient information, it is the lack of access to relevant clinical information. Here, relaxation can be contrasted with anxiety: while anxiety describes a state of vigilance, of being on guard, relaxation is associated with situations in which there is no perceived need to be on guard, no perceived risk.

7.1.9 Relief

For Desmet [24, p.4], relief is “enjoying the recent removal of stress or discomfort.” Yoon et al. [118, p.1197] associated it with a certainty of “an undesirable situation [having] gone away or changed into a better situation.” On this basis, I have associated relief with the identified appraisal doing less of a strain-inducing task. Several of the ward RNs’ positive stories were about the removal or reduction of some tasks that could be strain-inducing, namely phone calls and documentation.

“In this system we nurses use to communicate with the home care staff, we have the same chat function. […] It’s very convenient, because then we don’t need to call them often.”

Ward RN (P2)

The central aspect of the stories associated with the appraisal of doing less of a strenuous task is the perceived removal of strain or stress as the “undesirable situation.” Here, relief can thus be contrasted with psychological distress: while psychological distress is associated with a sense of overload, relief is associated with a decrease in the experienced mental stress.

It is important to specify the distinction between relief and joy. The removal or minimization of something unpleasant (associated with relief) does not necessarily indicate the presence of something pleasant (associated with joy). For instance, something can have become easier (or less demanding) but still not be easy (or effortless). That being said, relief and joy are not mutually exclusive, and several segments were coded with both relief and joy.

7.1.10 Confidence

Desmet [24] describes confidence as “faith in […] one’s ability to achieve something or to act in the right way.” Yoon et al. [118, p.1197] have associated confidence with a general appraisal of certainty of being “capable of overcoming a challenge in the process of realizing [one’s] goals.” Thus, I have associated confidence with the identified appraisal knowing what to do and how to do it. In their positive stories, the ward RNs talked about knowing about patient status and what to do for their patients — what treatment to
provide and how to provide it (i.e., the steps included in the clinical procedure). These experiences emerged thanks to the RNs finding all the information they needed about their patients and clinical procedures. This suggests a connection between convenient information access (see Section 7.1.7) and confidence. The timing of information access played an important role in fostering the RNs’ sense of knowing what to do and how to do it. For example, the ability to access clinical information prior to admitting or approaching a patient contributed to the RNs’ feeling of being ready to care for that patient.

“[Before], you had no idea who was going to be rolled in. You had a name, that was it. Now, I can look directly at the medication list, I can look at the lab results, if there is something I have to see and think of immediately when [the patient] comes up.”
Ward RN (P6)

The appraisal knowing what to do and how to do it could also apply to IT use — to a good mastery of one or more of the IT systems supporting RNs’ work. Across the participants’ stories, such a sense of mastery seemed to be fostered mainly by support from and shared documentation routines with colleagues at the ward level.

“Reading [up on patients] goes well if everyone documents in the same way, so that everyone knows where they find the information. Then it’s very easy.”
Ward RN (P5)

Certainty of action is the central notion across participants’ stories associated with the appraisal of knowing what to do and how to do it and confidence. Here, confidence can be seen as the opposite of perplexity, which is associated with appraisals of uncertainty.

7.2 Work-Related User Experience Goals for Hospital Clinicians’ Work-Related Information Technology Use

In this section, I map the negative and positive emotions and appraisals identified in section 7.1 to positive UX goals (i.e., positive target experiences to design for). Table 7.3 shows which emotions and appraisals (from section 7.1) have been mapped to which positive UX goals. Each UX goal includes a positive emotion and its associated appraisal. As mentioned in Section 6.4.4, these appraisals are formulated in the first person singular (i.e., from an end-user perspective) to emphasize that they are subjective experiential outcomes.
<table>
<thead>
<tr>
<th>Clinicians’ Experiences</th>
<th>UX Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frustration</strong></td>
<td>I experience joy as IT-supported task completion feels effortless</td>
</tr>
<tr>
<td>• Being unable to complete a task</td>
<td></td>
</tr>
<tr>
<td>• Tasks being unnecessarily cumbersome and time-consuming</td>
<td></td>
</tr>
<tr>
<td>• Investing an unnecessary amount of concentration into a task</td>
<td></td>
</tr>
<tr>
<td>• Failing to complete a task</td>
<td></td>
</tr>
<tr>
<td><strong>Psychological distress</strong></td>
<td>I experience relaxation as I feel supported in avoiding mistakes</td>
</tr>
<tr>
<td>• Being pushed to the limits of what one can handle</td>
<td></td>
</tr>
<tr>
<td><strong>Relief</strong></td>
<td>I experience relaxation as I feel I’ll be able to access a computer or information if and when I need to</td>
</tr>
<tr>
<td>• Doing less of a strenuous task</td>
<td></td>
</tr>
<tr>
<td><strong>Joy</strong></td>
<td>I experience confidence as I feel I know what to do and how to do it</td>
</tr>
<tr>
<td>• Tasks being easy and quick to complete</td>
<td></td>
</tr>
<tr>
<td><strong>Anxiety</strong></td>
<td></td>
</tr>
<tr>
<td>• Errors being possible</td>
<td></td>
</tr>
<tr>
<td><strong>Relaxation</strong></td>
<td></td>
</tr>
<tr>
<td>• Risk of error being reduced</td>
<td></td>
</tr>
<tr>
<td><strong>Relaxation</strong></td>
<td></td>
</tr>
<tr>
<td>• Access to clinical information being assured</td>
<td></td>
</tr>
<tr>
<td><strong>Perplexity</strong></td>
<td>I experience pride as I feel that I am providing the safest and highest-quality care</td>
</tr>
<tr>
<td>• Not knowing or understanding what to do</td>
<td></td>
</tr>
<tr>
<td><strong>Confidence</strong></td>
<td>I experience gratitude as I feel that others contribute to making my work easier</td>
</tr>
<tr>
<td>• Knowing what to do and how to do it</td>
<td></td>
</tr>
<tr>
<td><strong>Moral distress</strong></td>
<td></td>
</tr>
<tr>
<td>• Working in a way that falls short of best practices</td>
<td></td>
</tr>
<tr>
<td><strong>Alienation</strong></td>
<td></td>
</tr>
<tr>
<td>• Others’ actions or inaction being responsible for excessive work demands</td>
<td></td>
</tr>
</tbody>
</table>
7.2.1 I experience joy as IT-supported task completion feels effortless

When designing health IT systems and practices with the aim of fostering clinicians’ experience of positive emotions — and thus well-being — at work, joy is a first emotion that can and should be targeted. My analysis suggests that joy is evoked when clinicians come to feel that task completion is effortless — in terms of cognitive, motor (e.g., clicking, scrolling), and time demands. In other words, joy and effortlessness are likely to emerge when clinicians feel that they can complete a task easily (i.e., without unnecessary concentration or clicks) and quickly.

Joy and the appraisal of effortless task completion are to be contrasted with the experience of frustration and psychological distress associated with the sense that the work demands are excessively and unnecessarily high.

It is also important to differentiate between joy and relief as UX goals. Designers should aim for joy instead of merely relief since relief emerges from an appraisal of things being better, though not necessarily good. As health IT designers and implementers start working on fostering joy, relief is likely to be a side effect; however, it should not be (i.e., is not enough as) the end goal.

7.2.2 I experience relaxation as I feel supported in avoiding mistakes

Another positive emotion that is a valid target in the well-being-driven design of health IT is relaxation. My analysis has found that relaxation can be evoked by making clinicians feel supported in avoiding mistakes, and thus in preventing patient harm. Fostering this appraisal has to do with making it feel easy to do the right thing (and to do it right) and making it feel hard to do something wrong. In addition, promoting a sense that no potentially serious issue (e.g., exposing a patient to a substance or material they are allergic to, missing a medication administration, or ordering an excessively high dose of a medication) can go unnoticed is important.

Relaxation evoked by this sense of mistakes being unlikely contrasts with the anxiety nursing staff and physicians can experience due to their appraisal of mistakes being possible or easy to make.

7.2.3 I experience relaxation as I feel I’ll be able to access a computer or information if and when I need to

My findings suggest that relaxation can also be fostered through the appraisal of access to information being assured — nursing staff feeling certain they will be able to access either a computer (e.g., to document care) or clinical information (even old patient-related data) if and when they need to. Important
here is the availability of not only software (i.e., the EHR and other clinical and administrative systems being up and running), but also hardware (i.e., desktop computers or laptops).

7.2.4 I experience confidence as I feel I know what to do and how to do it

Confidence is another emotion that can be targeted in the well-being-driven design of health IT. Across my participants’ stories, I found that confidence was evoked by the appraisal of knowing what to do and how to do it. This appraisal is about knowing what to do in relation to both IT systems and patients; it contrasts with the appraisal of not knowing or understanding what to do associated with perplexity. IT-related knowledge includes knowledge about how to interact with the system (e.g., how to access a specific location) and about how to use it in accordance with organizational guidelines (e.g., knowing where to document what and where to find what information). Patient-related knowledge is about patient status (e.g., medication history) and patient treatment (e.g., knowing what medication to administer to a patient, or how a clinical procedure is to be completed).

7.2.5 I experience pride as I feel that I am providing the safest and highest-quality care

When seeking to foster clinicians’ well-being through the design of IT systems and practices, pride is another experience to aim for. Here, pride as a UX goal is to be understood as opposed to moral distress. As I’ve shown in Section 7.1.4, nursing staff can experience moral distress when they feel they need to compromise on the quality and safety of care when completing their tasks — in other words, when they feel they have to operate below their standards of care. In contrast, pride has to do with “one’s praiseworthy behavior surpass[ing] internal or external standard” [118, p.1197]. Therefore, designers and implementers should aim to foster a sense of providing the safest and highest-quality care — of surpassing internal and external standards of nursing care — among nursing staff to promote their experience of pride.

7.2.6 I experience gratitude as I feel that others contribute to making my work easier

Gratitude is also a target experience health IT designers and implementers should aim to foster to promote clinicians’, and especially nursing staff’s, well-being at work. Here, gratitude is to be understood as opposed to alienation, which I have found nursing staff can experience in connection with
work-related IT use. As I have shown in Section 7.1.5, nursing staff’s sense of others’ actions or inaction being at least partly responsible for some of their negative experiences can be associated with alienation. Fostering gratitude entails nurturing the opposite appraisal among nursing staff — that of others going “out of their way to do something good or nice” [33] for them. Evoking this appraisal and the gratitude associated with it requires working with RNs, NAs, physicians, and IT staff to ensure that nursing staff, and RNs in particular, feel supported by their co-workers and IT managers.

7.3 Communication Breakdowns Between Hospital Nursing Staff and Information Technology Staff

The IT staff members who participated in the study mentioned five different breakdowns in the communication between nursing staff and IT staff. These breakdowns affected both the communication from nursing staff to IT staff (i.e., nursing staff’s feedback on IT-related issues) and the communication from IT staff to nursing staff (i.e., information about IT systems and their use). Table 7.4 gives an overview of the mentioned breakdowns.

7.3.1 Lack of User Studies

Participants indicated being unable to conduct extensive user studies and long-term user surveying due to a lack of resources. Consequently, they felt they did not have as good an understanding of nursing staff’s needs as they wished, which they found frustrating. Indeed, they thought that being able to investigate end users’, and more particularly nursing staff’s, needs in more depth would help them better understand their needs and support them more effectively.

Table 7.4. Breakdowns IT staff members see in the communication between hospital nursing staff and IT staff.

<table>
<thead>
<tr>
<th>Communication from nursing staff to IT staff</th>
<th>Communication from IT staff to nursing staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of user studies</td>
<td>Nursing staff not checking the communications from the IT staff on the intranet</td>
</tr>
<tr>
<td>Low-level filtering of nursing staff’s electronic error reports</td>
<td>bilingual staff’s electronic error reports</td>
</tr>
<tr>
<td>Unintelligibility of nursing staff’s electronic error reports</td>
<td>Nursing staff not attending in-person training sessions</td>
</tr>
</tbody>
</table>

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7.3.2 Low-Level Filtering of Nursing Staff’s Electronic Error Reports

Participants reported that nursing staff could use an electronic error-reporting system to communicate with IT staff. However, they explained that a care coordinator filtered the electronic reports submitted through this system before they could reach IT staff members. As a result, participants did not see all of the error reports nursing staff submitted. They felt that this potentially skewed their picture of nursing staff’s UX and created a risk of potentially significant issues remaining unnoticed.

7.3.3 Unintelligibility of Nursing Staff’s Electronic Error Reports

Several of the IT staff members we talked to reported struggling to understand the contents of those of nursing staff’s electronic error reports that reached them, including what had gone wrong in the interaction between the end user and the system, what had caused the issue, and how it could be fixed. Participants attributed this issue to nurses’ lack of IT skills, and connected this lack of IT competence to nursing staff neglecting to attend the in-person training sessions that the IT staff unit provides (see below).

7.3.4 Nursing Staff Not Attending In-Person Training Sessions

For the IT staff interviewees, in-person training sessions were an opportunity for both nursing staff to learn proper IT use from them and for them to learn about nursing staff’s IT-related problems and needs. However, they admitted to not having sufficient resources to offer a training spot to every single member of the nursing staff working at the hospital. In addition, they explained that lack of time and lack of cooperation from nurse managers prevented nursing staff from attending these instructor-led training sessions. Indeed, it was up to nurse managers to send their staff to training and, from the IT staff members’ perspectives, many nurse managers did not prioritize in-person IT training.

7.3.5 Nursing Staff Not Checking the Communications From the Information Technology Department on the Intranet

The IT staff members we interviewed considered the intranet to be an important channel through which they could communicate important IT-related information to nursing staff. However, they were aware that they did not manage to reach all members of nursing staff through this channel. Indeed, they felt that nursing staff neglected to remain on top of IT-related matters via the hospital’s intranet. They also attributed this issue to lack of time (i.e., nursing
staff not having the time to check the intranet), and to nurse managers’ lack of cooperation — as they felt that nurse managers refused to relay IT-related information from the intranet orally to their staff.
8. Discussion

In this chapter, I first discuss my findings for my three RQs (Sections 8.1—8.3). I then present the main implications for design and practice that can be derived from my research (in Section 8.4).

8.1 Emotions Experienced by Hospital Clinicians in Connection With Information Technology Use

My first RQ was about the emotions that work-related health IT use evokes in hospital nursing staff and physicians. With this RQ, my aim was to bring awareness to the emotional impact of health IT systems and practices on clinicians, and to promote empathy with hospital nursing staff and physicians. Empathy with end users is an important prerequisite for successful design as “a deep understanding of users’ emotions […] can help gain relevant design insights” [119, p.169]. Moreover, since emotions shape well-being, examining emotions brings visibility to the potential negative and positive impacts of IT-related factors on users’ well-being. An emotion-focused approach shifts the focal point from the work outcomes, such as efficiency or errors, to user outcomes, such as well-being. In a context in which IT use has been associated with burnout — a state of emotional exhaustion that has been found to be detrimental to well-being [107, 62] — looking at work-related IT use through such a worker-centered lens seems particularly relevant and necessary. Nevertheless, the emotion-focused approach that I have applied in my work is not meant to replace other (e.g., usability- and needs-centered) approaches. Rather, it is intended to complement them by adding a new, person- and well-being-centered layer to the understanding of health IT use and its impact on clinicians’ work life.

My findings show that hospital nursing staff and physicians experience both negative and positive emotions at work in connection with their work-related use of health IT. The negative emotions to which IT use contributes in clinicians’ work lives include frustration, perplexity, anxiety, moral distress, alienation, and psychological distress; the positive emotions include joy, relief, relaxation, and confidence. The appraisals associated with these different emotions shed light on what matters to clinicians when it comes to their IT-supported work tasks. Across both negative and positive appraisals, the notions of effort and security stand out. Negative appraisals and emotions center on notions of excessive effort and of risk or uncertainty; positive appraisals
and emotions center on notions of effortlessness and of safety or certainty. It is important to specify that I am talking here about subjective feelings of effort or security (i.e., perceived effort and security), which should not be confused with fact-based measures of time use and patient safety. For instance, clinicians may almost never make a certain mistake and almost never endanger patient safety but still feel anxiety about the possibility of making that mistake. Thus, perceived effort and security may or may not match more objective measures of effort (i.e., cognitive load, efficiency) and safety.

My findings are in line with previous research on the impact of health IT use on clinicians’ work. The existing body of literature clearly shows that this impact is mixed, with both negative and positive effects [17, 105]. However, my findings provide nuance to a discussion which seems to have mainly focused on frustration [62, 76, 83, 104] when addressing this (negative) emotional impact of work-related health IT use. Although my analysis also suggests that frustration is a significant emotional impact induced by work-related IT use among clinicians, it furthermore shows that additional, sometimes very different, negative emotions can emerge, including perplexity, anxiety, alienation, and psychological and moral distress. Each one of these emotions highlights a different aspect of clinicians’ work-related IT use. For instance, alienation highlights the role co-workers and management (e.g., IT staff) play in shaping individual clinicians’ UX, while psychological distress points to the accumulation of time and cognitive demands that clinicians, and particularly nursing staff, are confronted with due to health IT use.

Furthermore, my findings related to negative emotions show how IT contributes both directly and indirectly to negative emotions during and about work. Frustration, perplexity, and anxiety are typically direct reactions to work-related IT use, and can indeed arise during single interactions with a system. On the other hand, psychological distress, alienation, and moral distress typically emerge due to an accumulation of problems, challenges or wasted minutes at the computer. For instance, it is the accumulation of IT-related demands and issues that lead to the sense of overload associated with psychological distress; it is the accumulation of time wasted during each interaction with IT that contributes to nursing staff needing to leave or avoid certain tasks, which is associated with moral distress; and it is also the perceived role played by other organizational actors (co-workers, IT staff) in those excessive IT-related demands that evoke the sense of disconnect and isolation associated with alienation. This suggests that acting on the factors contributing to frustration, perplexity, and anxiety has the potential to, indirectly, reduce psychological distress, moral distress, and alienation. In addition, I found that the perplexity that emerged due to clinicians not knowing how to carry out a task in an IT system could contribute to the appraisals associated with frustration, namely being unable to carry out a task, tasks being unnecessarily cumbersome and time-consuming, investing an unnecessary amount of concentration into a task, and failing to complete a task. This suggests that health IT design-
ers and implementers need to prioritize addressing that perplexity and promoting clinicians’ confidence in their ability to complete their IT-supported tasks successfully.

8.2 User Experience Goals for Hospital Clinicians’ Work-Related Information Technology Use

My second RQ was about appropriate UX goals for clinicians’ work-related health IT use. The aim of this RQ was to contribute to a description of a “high-quality” [82] work environment for hospital nursing staff and physicians from an experiential and emotional perspective. My intention was not to replace other ways of characterizing successful human—computer interaction in the workplace, but to present a different, complementary lens through which to examine and design for workplace IT use, including in safety-critical work settings. Some have questioned the relevance and adequacy of the UX construct for workplace technology design [49]. However, UX cannot be avoided, as experience is inherent in the process of living [27], no matter whether we are at work or at home, and whether we are using technology or not [44, 49]. Thus, as UX is unavoidable, it is in the best interests of designers and implementers of work-related IT to integrate a UX-centered lens into their processes and decisions. Indeed, by working towards explicit and specific UX goals — all while cultivating an awareness and understanding of potential negative user experiences — IT designers and implementers may be more likely to be successful in facilitating positive UX among workers [119]. Put another way, UX goals provide IT designers and implementers of work-related IT with an additional lens through which to assess and make IT-related decisions to promote a “high-quality” work environment for their employees.

Through my analysis, I have identified five positive UX goals for clinicians’ work-related IT use. Each goal comprises a discrete positive emotion and a specific appraisal associated with that positive emotion. The goals I have identified show that work-related IT use can (and should) promote clinicians’ experience of joy, relaxation, confidence, gratitude, and pride at work. These goals contribute to filling a gap in the literature, as few studies have identified UX goals for clinicians’ work-related IT use, and even fewer have done so from an emotion-focused perspective. Indeed, while there seems to be a consensus on workplace UX goals being distinct from UX goals for the leisure domain [16, 111, 49], there is still a lack of research into UX goals for work settings. This lack of concrete UX goals for the workplace may have contributed to some of the above-mentioned skepticism towards integrating a UX-centered lens in workplace IT projects. The goals I have presented in this thesis show that workplace UX does not have to be about “fun” (a UX goal typically associated with early UX research in non-work settings [44]), and that there are various positive emotions that are inherent in “high-quality”
working conditions, even in safety-critical settings. It must be stressed that
the UX goals that I have formulated in my research are meant to be facilitated
through the design of the IT systems and practices that clinicians engage with
in their daily work rather than through the design and implementation of sep-
parate applications aimed at promoting employee well-being. A fundamental
assumption in my work has been that health IT designers and implementers
can foster clinicians’ well-being without going “out of their way”; they can
design systems and practices so as to create working conditions that are likely
to have a positive emotional impact on clinicians.

I have used both positive and negative experiences to formulate my posi-
tive UX goals. In fact, two of the UX goals that I present, *I experience pride
as I feel that I am providing the safest and highest-quality care* and *I expe-
rience gratitude as I feel that others contribute to making my work easier*,
are solely based on negative experiences. This suggests that considering both
negative and positive experiences when defining positive UX goals can pro-
duce additional insights compared to focusing exclusively on positive experi-
ences (as several UX-centered and well-being-driven design efforts have done
[66, 123, 49]). These additional insights may be valuable in helping IT design-
ers and implementers not only to make already existing positive experiences
more frequent (i.e., more likely to emerge), but also to facilitate new positive
experiences and emotions. In addition, working towards fostering positive UX
goals based on negative experiences can be expected to reduce, at least to some
extent, the frequency of these negative experiences (although reducing the fre-
cy of negative experiences is not necessarily going to create conditions
that facilitate positive experiences and emotions [44, 119]).

In UX-centered design methods, defining UX goals (i.e., what target experi-
ence(s) to design for) is the first step in the design process [44, 114]. However,
I believe that UX goals can be useful in all stages of the systems design life
cycle, including user research and evaluation. For example, health care organi-
izations could examine the ways in which their current IT systems and practices
are fostering or hindering the different UX goals that I have identified, and use
that knowledge to improve upon the design (including customization and con-
figuration) of these systems and practices. Therefore, I believe that health IT
designers and implementers can benefit from engaging with these UX goals
even if they are not in the initial phase of UX-centered design, or not strictly
following a UX-centered design process.

It is essential to stress that the UX goals that I have presented in this work
are not meant to be facilitated to the detriment of care quality and safety. The
intention is not to lead clinicians into forming inaccurate appraisals connected
with work-related IT use to promote the experience of the presented positive
emotions. For example, clinicians are not to be induced into a false sense of
security — they are not to be misled into believing an IT-supported workflow
to be less prone to error than it actually is — just to promote the experience
of relaxation. Rather, the UX goals are intended to support health IT design-
ers and implementers in making decisions that will lead to health IT systems and processes providing the “right” conditions for the target appraisals and emotions to emerge.

Furthermore, the idea is not to remove all negative emotions from clinicians’ experience of work. Negative emotions are not always detrimental to well-being [34, 35, 44]. Rather, the intention is, first, to avoid adding to clinicians’ experience of negative emotions with ill-fitted IT systems or practices. Second, it is to intentionally use IT systems and practices to facilitate clinicians’ experience of positive emotions. When considering the UX goals that I have proposed in this thesis, it is also important to remember that these goals refer exclusively to clinicians’ work-related IT use, and not to their work in general. Clinicians’ experience of their work as a whole is likely to be much more complex, rich, and nuanced than their experience of work-related IT use, although this experience of work-related IT use is part of clinicians’ broader experience of work.

8.3 Communication Breakdowns Between Nursing Staff and Information Technology Staff Members

My third RQ was about the breakdowns that IT staff members saw in the communication between hospital nursing staff and IT staff. My aim with this RQ was to shed light on IT staff members’ work and to identify areas for improvement in that work, particularly in relation to their involvement of nursing staff in the design and implementation of health IT.

I identified breakdowns in multiple communication channels, both from nursing staff to IT staff and from IT staff to nursing staff. One of the most significant breakdowns seemed to be nursing staff not attending the in-person training workshops organized by IT staff. For IT staff members, this lack of training had two very significant negative consequences: nursing staff not using IT systems “properly,” and nursing staff writing unintelligible error reports.

The breakdowns I have identified suggest that nursing staff are not sufficiently involved in IT-related processes, and that IT staff members lack a deep understanding of their needs. These findings are in line with what previous research has reported about the insufficient involvement of nursing staff in health IT design and implementation [15, 90, 104, 105].

Interestingly, IT staff members mostly seemed to blame nursing staff and, in particular, nurse managers, for the identified breakdowns. IT staff members felt that nursing staff were not doing — learning, informing themselves — enough about IT in order to improve their use and experience of health IT. This reproach echoes some of the existing literature on nursing staff’s engagement in IT-related matters. For instance, Procter et al. [90] found that nursing staff shied away from engaging in health IT design and implementation pro-
cesses. Nevertheless, IT staff members also acknowledged some shortcomings in their own work, namely their inability to conduct extensive user studies and to offer in-person IT training to all members of the nursing staff. Participants attributed these shortcomings to a lack of resources, which suggests that the underlying issue is organizational.

8.4 Implications for Design and Practice

Ultimately, my aim with my three RQs and Studies A—D has been to contribute to improving clinicians’ experience of working with IT. This aim relies on the assumption that a more positive experience of work-related IT use will foster clinicians’ well-being at work. I have sought to contribute to improving clinicians’ experience of work-related IT use by informing the design and implementation of health IT from an emotional and well-being perspective. Therefore, I want to discuss here the main insights and implications for design and practice that can be drawn from my findings.

Before presenting these different insights and implications, I want to emphasize that multiple different socio-technical factors shape health IT systems and practices, and the way clinicians experience these systems and practices. For instance, Sittig and Singh [102] present eight socio-technical dimensions which, together, shape health IT systems and practices in health care organizations. These eight dimensions include, for example, the technical IT infrastructure (comprising both hardware and software), human-computer interaction factors (related to the interface design), collaboration and communication practices between different actors within the health care system, organizational policies and procedures, and external rules and regulations. This model is useful because it shows that clinicians’ UX is shaped by many different factors, and that it may well be impossible to map one specific experiential outcome (e.g., frustration, joy) to one specific factor. Similarly, there may be many different ways of fostering positive experiential outcomes. In this context, I have chosen to present the insights and implications for design and practice that I have identified based on my findings by associating them with different, broader areas of improvement.

8.4.1 Fostering Shared Information Technology-Supported Routines Between Clinicians

Participants across Studies A—C have mentioned tensions and breakdowns in the communication and collaboration among and between clinicians, including among nursing staff (i.e., between RNs, and between RNs and NAs) and between nursing staff and physicians. My findings point to a connection between these tensions and breakdowns and different aspects of clinicians’
negative UX, especially their experience of alienation and perplexity. For instance, physicians omitting to document certain aspects of care or to create some MOs in the EHR could lead to nursing staff experiencing frustration, perplexity, and alienation: frustration of failing to find the information they needed, perplexity of not knowing what care they needed to provide to the patient, and alienation due to a sense of physicians’ not doing enough to enable them to do their job efficiently.

In contrast to these breakdowns, my analysis suggests that successful collaboration and communication between clinicians leads to positive experiential outcomes. For example, shared documentation routines between nursing staff (between RNs and between RNs and NAs) seemed to contribute to nursing staff’s experience of joy and confidence. Indeed, shared contributed routines resulted in nursing staff knowing where to find and document what information (confidence) and, as a result, accessing the information they needed easily (joy).

The negative experiential outcomes associated with IT-related tensions between clinicians and the positive experiential outcomes associated with shared IT-related collaboration and communication routines among clinicians suggest that supporting clinicians in establishing shared IT-supported work routines may contribute to improving their work-related UX. Our participants mentioned a ward-level documentation workshop held by the RN responsible for documentation within the ward as one measure that had improved their experience of working with IT (by reducing the amount of duplicate documentation and helping the different staff members to document in the same way).

8.4.2 Improving the Communication and Collaboration Between Clinicians and Information Technology Staff

My findings from Studies A, B and D show that there is a disconnect between IT staff and nursing staff. In Study D, IT staff members reported lacking clinician input and criticized what they saw as a lack of engagement in IT-related matters on the part of nursing staff. They felt that the nursing staff would have a better experience of working with IT if they attended the IT staff’s in-person training sessions and systematically read the IT staff’s communications on the intranet. Simultaneously, in Studies A and B, the nursing staff reported avoiding or being unable to complete some tasks about IT, such as reporting IT-related issues. In Study B, they also reported a lack of, from their perspective, adequate training opportunities and a lack of consideration for their needs from the IT staff. In other words, nursing staff felt that (at least some of) the IT staff’s decisions about IT-related matters were detrimental to them and added to their work and cognitive load instead of relieving it. My analysis found that the IT staff’s perceived disregard for the nursing staff’s needs
in their IT-related decisions contributed to the nursing staff’s experience of perplexity and alienation in connection with work-related IT use.

Fundamentally, my research suggests that the disconnect between IT staff and nursing staff emerges from two central elements: the communication channels that currently exist between them, and the expectations each group has of the other (the two of which are interconnected, as I explain below). When it comes to the communication channels supporting the communication between nursing staff and IT staff, it seems that they do not fit the nursing staff’s needs. Indeed, nursing staff (according to IT staff members) do not have the time to attend in-person training sessions, and (by their own admission) avoid using IT-supported channels of communication with IT staff to avoid wasting time, and also because they do not always know how to report issues.

This poor fit between nursing staff’s needs and the current communication channels between them and IT staff suggests that new, different channels or opportunities for communication between nursing and IT staff need to be created to foster successful communication between these two professional groups. Non-IT-supported communication channels may not necessarily be more effective than IT-supported ones, since nursing staff can also refrain from calling IT staff on the phone. Therefore, forms of communication in which IT staff members “fetch” the information from nursing staff may be required. Such a solution would be a way for IT staff to lower their demands on nursing staff in regard to IT-related matters. It would be in accordance with the wishes of nursing staff for IT staff to do more (i.e., make things easier) for them, but go against the current position of IT staff members. Indeed, Study D’s participants reported expecting nursing staff to do more. However, my findings from Studies A and B suggest that nursing staff cannot do more, and that, at least in some situations, the IT-related demands they face are already too high and contribute to their experience of psychological distress at work.

8.4.3 Improving Clinicians’ System Knowledge and Understanding

A recurring finding across all my studies (Studies A—D) was that clinicians (both nursing staff and physicians) did not know how to carry out some IT-supported tasks and did not understand the logic behind some system events (e.g., an icon suddenly becoming unavailable, being kicked out of a system) and responses (e.g., a pop-up comment prompt, an error message). This lack of knowledge and understanding negatively affected clinicians’ use of both clinical and administrative systems.

Clinicians’ lacking system knowledge and understanding and the negative experiential outcomes associated with this (e.g., perplexity, frustration) suggest that clinicians need to be (better) supported in both learning how to com-
plete their tasks in clinical and administrative systems and in understanding the logic(s) that these systems use. Such improved support might require IT staff to find different, more appropriate ways of training clinicians. For nursing staff, ward-level, customized training sessions at each ward in which both IT-supported workflows and system logic are discussed might be adequate. Supporting clinicians in improving their knowledge and understanding of IT systems might also require giving them more time to explore these systems outside of their actual clinical practice, and providing them with a more continuous form of direct IT support on site.

8.4.4 Improving the Information Technology Infrastructure

Another recurring finding across Studies A—C was that technical issues impeded clinicians in their work and contributed to their experience of frustration and perplexity. These issues included slow system response, system bugs (such as being kicked out of the system, or the system freezing), and lacking interoperability and synchronization between systems (requiring clinicians to manually transfer information from one system to another, document the same information more than once, log in separately in each system, etc.).

These technical issues and the negative experiential outcomes associated with them suggest that health IT implementers might need to invest in new hardware (whose capacity matches the requirements of the latest health IT system versions they have implemented), and to improve the interoperability between their different health IT systems. High interoperability also needs to be prioritized as a requirement when procuring new health IT systems. It is crucial for health IT implementers to consider the merits of systems both individually and as a part of the broader health IT infrastructure in place.

8.4.5 Improving the Design of Health Information Technology Systems’ Interfaces

Some of the elements to which clinicians attributed their negative and positive stories in Studies B and C were related to the design of the systems’ interfaces. Such interface design-related issues included the lack of visibility of (potentially) life-threatening interactions (among all interaction warnings), the lack of a satisfactory overview of a patient’s past medication history, and the display of medication administration times (which, according to one RN, “moved around a bit”). In addition to these visualization issues, there were also interaction issues, such as the need to resume a medication before removing it, and the (according to participants) click-intensive nature of some workflows. These issues typically led to frustration and perplexity.

Simultaneously, I found that some design-related elements contributed (at least in some situations) to positive experiential outcomes, particularly joy,
confidence, and relaxation. These positive design elements included time-saving features such as templates, shortcuts (e.g., navigation shortcuts or links to FASS in the medication module), and shorthand notations. Other features participants mentioned in their positive stories — including checklist-like care plans, missed medication administration warnings, interaction warnings, and reminders — provided some form of cognitive support.

These positively experienced features suggest that health IT designers and implementers may improve clinicians’ work-related UX by further developing and adding time-saving and cognitive support features, and by improving data visualization. It is also worth noting that participants mentioned some features, such as templates and interaction warnings, in both their positive and negative stories. For example, physicians appreciated the safety provided by interaction warnings, but also felt that it was easy to miss life-threatening warnings; they appreciated the efficiency associated with using templates, but at the same time felt that predefined units made it easy to make mistakes. This shows that health IT designers and implementers need to design and evaluate these types of “positive” features in a nuanced manner.
9. Limitations and Future Work

Several limitations need to be considered when engaging with the research presented in this CS.

It is important to remember that the characteristics of my research setting contribute to shaping my participants’ UX. Contextual factors, such as, among many others, the nurse—patient and physician—patient ratio, have an influence on the way clinicians experience IT systems and IT-supported work. Indeed, UX always emerges from an interplay between situation (or context of use), user (e.g., their previous experiences and current expectations), and system(s) [74, 94, 119]. This is also something that my participants stressed. For example, participants explained that the many clicks required to read up on patients might not be a problem if they were having a quiet day at work, or if they had fewer patients under their care. Future research should examine the interplay between different contextual factors and clinicians’ UX.

Similarly, I have not examined my participants’ socio-demographic and personal characteristics, and the ways these characteristics potentially shaped their experience of work-related IT use. Rather, I endeavored to talk to a diverse group of clinicians (i.e., participants with different socio-demographic characteristics) and identified themes that are likely to be relevant for a wide range of user profiles (e.g., different age groups). I made this choice because I wanted to focus on the UX and the conditions (e.g., features, routines) associated with this UX rather than on users’ characteristics or abilities. My underlying assumption was that health IT designers and implementers are responsible for providing clinicians with IT systems and IT-related practices that promote well-being instead of asking clinicians to adapt to difficult working conditions. Nevertheless, in practice, a combination of improved working conditions and, on the workers’ side, an enhanced ability to cope with work-related stressors, including IT-related ones, is likely to be most effective in enhancing their work well-being. Therefore, future research should examine the interplay between user characteristics and UX. For instance, it could be interesting to examine the personal characteristics that are associated with the frequent experience of positive emotions connected with IT use, and to take steps to support workers in acquiring or further developing these characteristics. Such an approach would be in line with mHealth interventions targeted at improving clinicians’ occupational health [22, 117].

Furthermore, my research focuses exclusively on clinicians’ experience of work-related IT use. However, there is much more to clinicians’ experience of work in general than IT-related aspects (i.e., UX). Future research should examine clinicians’ experience of work as a whole by identifying patterns across
clinicians’ negative and positive stories about their daily work life and using these to re-imagine and re-design clinicians’ work (i.e., both the IT-related and the non-IT-related aspects of their work). Following the example set by Laschke et al. [66], future research could also use clinicians’ happiest moments at work as a point of departure to design new technology that would facilitate and enhance these positive work experiences.

Another important limitation of my work is that I have not measured the frequency of the identified appraisals and emotions. Consequently, my findings do not indicate how often certain situations (e.g., being unable to carry out a task, failing at completing a task, not knowing what to do, etc.) occur in clinicians’ daily work. Future research should examine the frequency of each appraisal for different groups of clinicians (e.g., ward RNs, ward NAs, OR RNs, OR NAs, physicians, etc.). I have furthermore not measured the intensity of the emotions experienced by my participants, but rather my work has focused exclusively on identifying the different emotions that clinicians experience in connection with their work-related use of health IT. Future research could endeavor to quantify how strongly clinicians experience each emotion.

In addition, future research should examine the extent to which the emotions that clinicians experience in connection with work-related IT use affect or are correlated with their overall well-being at work. Previous research has found an association between health IT use and clinician burnout [64, 75, 76, 83, 100], but, to my knowledge, no study has yet examined the potential correlation between discrete emotions felt in connection with work-related IT use and clinicians’ overall well-being at work.

Future research also needs to examine the extent to which each group of clinicians experiences each of the identified appraisals. Indeed, it is important to stress that I have not asked nursing staff and clinicians explicitly about each appraisal; rather, I let each group or person come up with their own stories. In addition, my interviews varied in focus and scope. For example, my interviews with physicians focused on their experience of working with electronic MOs, while my interviews with nursing staff were not limited to any particular artifact or system. This means that, even though physicians might not have shared stories that I could associate with an appraisal that nursing staff mentioned, they may still experience that appraisal. In other words, ward or OR RNs, ward or OR NAs, or physicians not being associated with an appraisal in this thesis does not mean that they do not experience it.

Similarly, I have not examined the communication between hospital physicians and IT staff. Future research should inquire into whether this communication suffers from the same breakdowns as the communication between hospital nursing staff and IT staff, or whether the dynamic between IT staff and physicians is different from that between nursing staff and IT staff. It would be interesting to consider both IT staff members’ and physicians’ perspectives on the subject.
Finally, future research needs to put the UX goals I have identified to the test and evaluate their usefulness. Does using these UX goals during health IT design or implementation effectively support health IT designers and implementers in creating conditions that foster clinicians’ experience of positive emotions in connection with work-related IT use?
10. Conclusion

The current thesis has focused on two problem spaces. First, it has examined clinicians’ experience of working with IT from an emotion-focused perspective. Through interviews and focus groups with hospital nursing staff and physicians, my research has identified discrete negative and positive emotions that clinicians feel at work in connection with work-related IT use. These emotions are frustration, perplexity, psychological distress, moral distress, alienation, anxiety, joy, relief, confidence, and relaxation. On this basis, I have then formulated UX goals for the design and implementation of health IT systems: I experience joy as IT-supported task completion feels effortless, I experience relaxation as I feel supported in avoiding mistakes, I experience relaxation as I feel I’ll be able to access a computer or information if and when I need to, I experience confidence as I feel I know what to do and how to do it, I experience pride as I feel that I am providing the safest and highest-quality care, and I experience gratitude as I feel that others contribute to making my work easier.

The second problem space that my work has addressed is the communication between health IT staff members and clinicians. On the basis of interviews with IT staff members affiliated with a large Swedish hospital, I have identified different breakdowns that undermine the IT-related communication between IT staff members and hospital nursing staff. These breakdowns were lack of user studies, low-level filtering of nursing staff’s electronic error reports, unintelligibility of nursing staff’s electronic error reports, nursing staff not attending in-person training sessions, and nursing staff not checking the communications from the IT staff on the intranet. My findings have several implications for design and practice. They suggest that health IT designers and implementers may improve clinicians’ work-related UX by supporting them in learning how to complete their IT-supported tasks, understanding the logic(s) that their different IT systems use, and establishing shared IT-related work routines. Health IT designers and implementers are also likely to foster clinicians’ positive experience of working with IT by providing them with (further) adequate time-saving, cognitive support and data visualization features. Furthermore, my results show that health IT implementers need to create different communication channels to encourage and support nursing staff’s involvement in IT-related matters. Health IT implementers might also need to invest in new hardware and improve the interoperability between their different health IT systems to improve clinicians’ experience of working with IT.
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A doctoral dissertation from the Faculty of Science and Technology, Uppsala University, is usually a summary of a number of papers. A few copies of the complete dissertation are kept at major Swedish research libraries, while the summary alone is distributed internationally through the series Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology. (Prior to January, 2005, the series was published under the title “Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology”.)