

Effortlessness and Security

Nurses' Positive Experiences With Work-Related Information Technology Use

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Nurses' well-being at work has been an increasing concern the past few years, in particular in connection with work-related information technology use. Researchers have thus been called to explore ways of fostering nurses' well-being at work. However, little is known about the factors related to information technology that contribute to nurses' positive experience of and well-being at work. In this study, we sought to understand the appraisals and emotions at the core of nurses' positive experiences with information technology use at work. We conducted focus groups and semistructured interviews with 15 ward nurses working at a large Swedish hospital. The data were analyzed qualitatively using process and causation coding. We found appraisals of easy goal accomplishment, doing less of a particular task, knowing what the situation is and what has to be done, mastering the system, reduced risk of mistakes and omissions, and assured access to patient information. Using design theory, we connected these appraisals with four positive emotions: joy, relief, confidence, and relaxation. These findings suggest that effortlessness and security are central to nurses' positive experience of information technology. Implementing information technology-related features and practices associated with them in healthcare organizations may foster nurses' well-being at work.

KEY WORDS: Emotions, Hospital nursing staff, Information communication technology, Nursing informatics, Occupational health

Positive experiences generate positive emotions and foster well-being, whereas negative experiences generate negative emotions and can thus be detrimental to well-being.¹ In fact, the experience of positive emotions at work has been associated with a range of positive work outcomes,² whereas nurses' experience of negative emotions at work has been found to be related to nurse burnout.³

The use of health information technology (IT), and in particular that of the electronic health record (EHR), has long been known to be a source of negative work experiences for nurses. A solid body of research documents the negative impacts of IT use on hospital nurses' work.⁴⁻⁹ These negative impacts include an increased workload due to the need to troubleshoot systems,⁴ make phone calls to track down information,⁵ and enter data multiple times.⁶ Nurses have also reported being slowed down due to technical issues^{5-7,10} and struggling to find^{6,9} and access^{5,6} information in the systems. Understanding patient status based on the information available^{5,6} can also prove difficult. Nurses' negative experiences with work-related IT use have been associated with six main negative emotions: frustration, psychological distress, moral distress, perplexity, anxiety, and alienation.¹¹ In addition, recent statistical analyses have identified a correlation between EHR use and nurse burnout.^{12,13} Researchers have therefore called for EHR issues to be addressed in order to foster nurses' well-being.¹⁴

However, IT use can also be a source of positive work experiences for nurses. Researchers have identified several aspects of IT use that nurses experience positively. For instance, hospital nurses have indicated being able to access and retrieve electronic patient information quickly and easily^{5,9,15,16}; all of the information is in one place,¹⁶ and nurses no longer have to hunt down patient charts.⁹ In addition, electronic records are easy to read,^{9,17} and nurses no longer need to decipher others' handwriting.⁹ They can keep track of a patient's changing health status^{5,9} and efficiently communicate with other healthcare providers, such as doctors.^{5,9} Nurses furthermore appreciate the comprehensiveness of the information available in the EHR and other IT systems,^{8,10,16,18,19} as it provides them with a holistic view of their patients.¹⁶ They also feel that IT use has a positive impact on the medication administration safety and the prevention of medication errors.^{4,8,9}

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Other positive experiences related to IT use involve getting support from other nurses⁴ or IT support¹⁰ when problems with systems occur. Yet, these positive experiences have seldom been examined from an emotional or well-being perspective.

Mentions of positive emotions in relation to IT use are extremely rare in the literature. For example, Burkoski et al.⁴ report that IT-enabled safety mechanisms induced peace of mind in some nurses. Califf et al.¹⁰ mention “positive feelings” emerging from perceptions of IT’s usefulness, being provided with technical support, and involvement in IT design, but they do not refer to any specific emotion. This lack of insight into nurses’ positive experiences with IT use may hinder the implementation of changes to IT design and processes that go beyond reducing or eliminating negative experiences and truly foster the experience of positive emotions at work. This is because positive and negative emotions are often experienced as independent constructs,¹ and eliminating negative work experiences and the negative emotions they induce does not necessarily equate the experience of positive emotions. Well-being requires both positive affect and low negative affect.²⁰

In this article, we therefore undertake an in-depth, qualitative analysis of ward nurses’ positive experiences with IT use. Our approach is rooted in the concept of user experience, which refers to the thoughts and emotions that people

experience before, during, and after an encounter with an interactive system.²¹ Appraisal theories of emotions make a causal link between thoughts and emotions within user experience.²² Indeed, they argue that an individual’s emotions are shaped by their appraisals—their assessments of the significance of an event for the fulfillment of their needs or goals.²² Appraisals are thus key to understanding user experience and emotion. In fact, appraisal theory assumes that each emotion is associated with a specific appraisal pattern or “core relational theme.”²³ Thus, because “the same appraisals lead to the same emotions,”²² emotions can be identified on the basis of their corresponding appraisals. Researchers in the field of human-computer interaction^{23,24} have coined the core relational themes of 25 positive emotions in human-product interactions to support designers and researchers in understanding and recognizing emotions.

On this basis, our analysis focuses on examining the appraisals at the heart of ward nurses’ positive work experiences connected with IT use. We then associate these appraisals with their corresponding positive emotions using Yoon et al.’s²³ core relational themes. Figure 1 illustrates this relationship between appraisals and emotions. Through this analysis, we aim to provide a view of the concrete ways in which work-related IT use can foster hospital nurses’ experience of positive emotions at work.

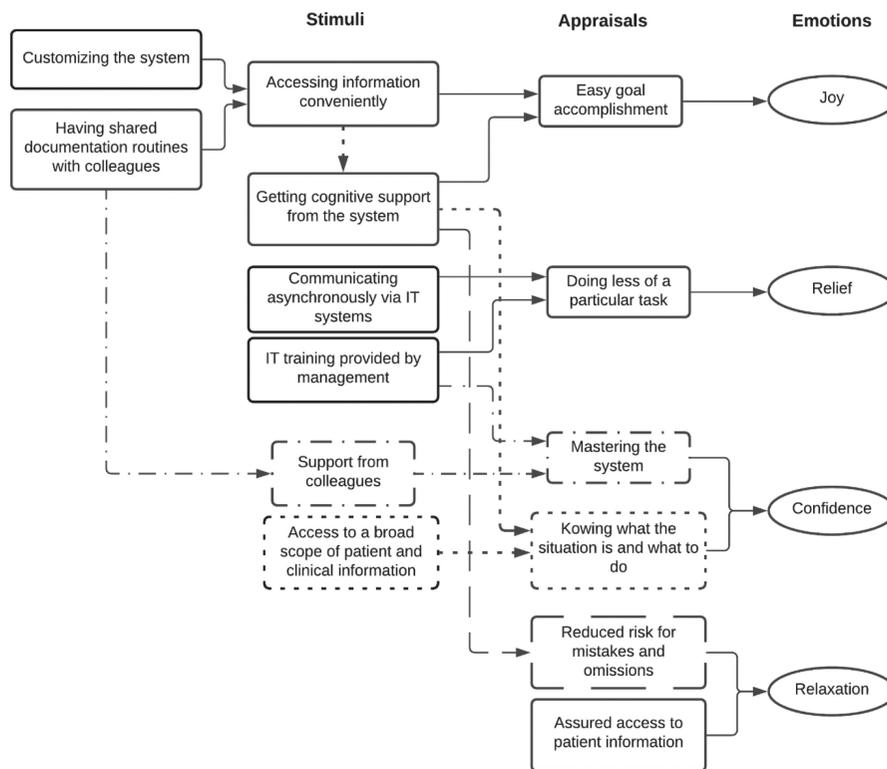


FIGURE 1. Overview of the emotions (in ellipses, right) identified in nurses’ positive experiences with work-related IT use and the appraisals (second column from the right) and stimuli (two first columns from the left) associated with them.

This article's contribution to the nursing informatics field is twofold. First, it identifies appraisals and positive emotions that hospital nurses experience at work in connection with work-related IT use. Second, it maps these positive emotions and appraisals onto the IT-related stimuli that elicit them. This knowledge may support healthcare organizations in adapting their IT systems and IT-supported processes in a way that fosters nurses' experience of positive emotions and well-being at work.

METHODS

Study Setting

Uppsala University Hospital is a large Swedish hospital that employs about 8300 people, among whom 2500 are registered nurses. Most healthcare processes at the hospital are supported by commercial off-the-shelf computerized systems. The current, hospital-wide EHR system has been in use for over a decade, although it was significantly updated right before our first data collection. The EHR covers, among other things, the care plans nurses use to prepare and document patient care and a medication module that supports medication prescription and administration. Beyond the EHR, Uppsala University Hospital uses a variety of clinical and administrative systems. This digital environment is in constant evolution: systems are updated, added to, or removed on a regular basis. 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. As these systems have been provided by different vendors, they are not always interoperable and lack a standardized graphic profile or logic. For example, they can use different labels for similar things. Furthermore, different teams of administrators are responsible for the maintenance of those systems. Staff do not regularly receive instructor-led education when learning new IT systems. Instead, most training is handled through video-based introductions offered on an in-house e-learning platform, which staff members often do not have time to use. However, one nurse on each ward is in charge of documentation and receives extra training and information about the EHR.

Participants

Table 1 provides an overview of our data collection sessions and participants. Overall, 15 registered nurses—13 women and 2 men—participated in the study. They worked in dif-

ferent surgical and children's hospital departments. The data collection sessions were spread across 3 years due to the transcription and preliminary analysis of the focus groups before the interviews and to factors beyond the researchers' control, including recruiting difficulties. A nurse manager and a nurse, both members of the project's reference group and also working at Uppsala University Hospital, recruited the focus group participants and the three first interviewees. The first author recruited the three last interviewees directly following a presentation of the study at the ward.

Data Collection

The study was approved by the Swedish Ethical Review Authority prior to the recruitment of participants (EPN 2017/045). Initially, the purpose of the study was to explore nurses' experiences with work-related IT use. As data analysis progressed, this purpose evolved into the identification of the emotions at the core of nurses' experiences with work-related IT use on the basis of the appraisals associated with them. We carried out two focus groups (FG1 and FG2) and six interviews (P1–P6). The first focus group was 90 minutes long and facilitated by the first author, a junior researcher, together with the third author, a senior researcher with extensive experience in qualitative data collection; the second focus group lasted about an hour and was moderated by the first author. Interviews were between 40 and 60 minutes long. All interviews except one (P3) were conducted by the first author. In both the focus groups and the interviews, participants were asked to recount negative and positive experiences involving their daily work-related IT use. The data collection sessions did not focus on any specific system, and participants were encouraged to mention any system they felt was relevant to their daily work. The variety of systems addressed encompassed clinical systems including the EHR and the operation planning system, and communication systems such as the chat system used to communicate with the municipality's home care team. Our intention with the focus groups was to encompass a large variety of experiences. We first invited participants to bring up any positive or negative, small or more significant IT-related episode from their daily work lives. In the second phase, we asked them to reflect on the consequences of these experiences. As we saw a significant overlap between participants' stories in both focus groups, we decided not to conduct

Table 1. Overview of the Study's Participants

Data Collection Session	Number of Participants (Registered Nurses)	Ward(s)	Age Range
Focus group 1 (fall 2017)	6 (5 women, 1 man)	Surgery ward	25–33 y
Focus group 2 (spring 2018)	3 (2 women, 1 man)	Pediatric oncology ward, neonatal ward	43–46 y
Interviews 1–6 (spring 2019–spring 2020)	6 (5 women, 1 man)	Surgery wards	22–39 y
	Total: 15 (12 women, 3 men)		

additional group sessions. Instead, we conducted interviews to collect more in-depth information. We asked the interviewees about their thoughts and emotions associated with positive and negative work episodes involving IT and used the background knowledge acquired during the focus groups to formulate insightful follow-up questions. After six interviews, the recurrence of experiential elements across interviewees suggested that some degree of data saturation had been reached. Consequently, data collection was ended at that point. We audio recorded and transcribed verbatim all focus groups and interviews.

Data Analysis

We began by selecting the positive experiences in our data. Negative experiences were analyzed separately and are the object of another publication. We analyzed the positive experiences qualitatively from within a relativist ontology and a subjectivist epistemological stance.²⁵ The aim of the analysis was to understand nurses' positive user experiences,²¹ and especially the appraisals (assessments of the significance of the environment for one's needs and goals²²) and emotions within these experiences. We started the coding process by creating in vivo codes—short phrases from the participants' own language²⁶—for each one of the positive experiences. This in vivo coding aimed to capture the key elements in each experience and thus create a scaffold for the rest of the coding process. Next, the key elements in each experience were coded with gerundive codes (ie, so-called process codes²⁶). These gerundive codes were interpretations of events and appraisals unfolding within an experience. They were formulated from the perspective of the participant(s), for example, “being supported in keeping track of medication administration tasks.” Once all experiences had been coded, the gerundive codes were brought into categories, such as “getting cognitive support from system.” The next phase in the coding process centered on defining the key appraisal(s) in each experience and matching them with their corresponding emotion(s). The in vivo codes and gerundive code categories from the previous coding steps were revisited;

additional codes (often single words, such as “effortlessness”) were created when needed to define further the key appraisal(s) in each positive experience. The defined appraisals were then compared and matched with emotion definitions and core relational themes presented by Desmet²⁴ and Yoon et al²³ (see Table 2). Through this matching process, the emotions at the heart of the positive experiences were identified. Finally, the gerundive code categories and emotions were coded as part of a sequence using the causation coding method.²⁶ The purpose of this final step in the analytical process was to understand the relationship between our different codes (gerundive code categories, appraisals, and emotions) and identify patterns in these relationships. For example, we found that “getting cognitive support from system” usually led to the appraisal of “knowing what the situation is and what has to be done,” which was associated with confidence.

Different steps were taken to ensure the trustworthiness²⁷ of our study. The first author wrote extensive memos throughout data analysis to ensure dependability. Credibility was strengthened by (1) the use of in vivo codes in the coding of appraisals and emotions and (2) the use of emotion and design theory^{22–24} in the coding of emotions (see Table 2). The detailed report of our analytical procedure, the description of our research setting, and the quotes from participants provided in the results section (see below) aim to support the reader in assessing both the credibility of our findings and their transferability to their own research or work settings.

RESULTS

We found six appraisals at the heart of hospital nurses' positive experiences with work-related IT use, which we associated with four positive emotions: joy, relief, confidence, and relaxation. We also identified eight different stimuli of these positive appraisals and emotions. Stimuli here refer to events that, in the positive experiences we have analyzed, appeared to enable the emergence of the found key appraisals and their associated emotions. Figure 1 presents an overview of our findings. In the following sections, we present each emotion and describe their associated appraisal(s) and stimuli.

Table 2. Definition and Core Relational Theme of Each of the Four Emotions Identified in This Article According to Desmet²⁴ and Yoon et al²³

Emotion	Definition (From Desmet ²⁴)	Core Relation Theme (From Yoon et al ²³)
Joy	“Experience of being pleased about (or taking pleasure in) something or some desirable event”	“Something that facilitates goal accomplishment happens or provides sensory pleasure”
Relief	“Experience of enjoying the recent removal of stress or discomfort.”	“It is certain that an undesirable situation has gone away or changed into better situation”
Confidence	“Experience of faith in oneself or in one's ability to achieve something or to act in the right way. The related feelings are self-assurance, security and certainty [...]”	“It is certain that one is capable of overcoming a challenge in the process of realizing his/her goal”
Relaxation	“Experience of enjoying a calm state of being, free from mental or physical tension or concern”	“It is certain that an undesirable event will not occur in any way”

Joy

We define joy in the context of this study as the experience of taking pleasure in one's work and associate it with participants' appraisal of effortlessness: easy goal accomplishment and smooth workflow. Many of the participants' stories centered on processes and actions that were described as "easy" or "simple." Effortlessness was thus a central theme in our data.

A stimulus of this appraisal of effortlessness in multiple segments was easy and/or quick access to needed information. Three aspects of convenient access to information were mentioned by participants: having only one information source—the computer—to retrieve information from; having computers available close by—for example, in the corridors and in the medication room in addition to the nursing station; and finding needed information easily and/or quickly once logged in to a system. Different elements could foster participants' ability to quickly locate and/or access information in the EHR. Participants, for example, reported being able to customize some display windows and navigation menus:

You can create this menu [...]. You can put things in order there, choose record, medication registry, lab results and it is like this—if you are a coordinator and call the patient, you can also have lots of other things there that are important for [you]. Otherwise, it would for sure have required lots of additional clicks. So I think it's good. You can individualize what you are looking for. (Marina, FG1)

Some EHR design features, such as tabs to access information written by different roles (physicians, nurses, dietician, physiotherapists, etc) and links to descriptions of clinical routines in the EHR, were also mentioned as facilitating information access. Finally, several participants specified that documentation routines shared across all nurses (ie, all nurses documenting the same things in the same system locations) was a precondition for easily locating information. We thus identified customizing the system and having shared documentation routines with colleagues as stimuli of nurses' ability to access information conveniently.

Another stimulus of the appraisal of easy goal accomplishment that appeared in several participants' stories about effortlessness had to do with nurses feeling that they were getting some form of cognitive support from the system. For example, several participants expressed appreciation for the medication administration view in the EHR, which made it clear which medication had to be administered when, and how it should be given:

I actually think that you get a very good overview of the patients' medications. [...] It is easy to know when you are to administer things. (Magdalena)

I think that [the medication list] is good to dispense medication. The list is good. Just the... It is very clear... what you are to give, and when you are to give it. You see for example if you are to give something

intravenously, then there is a picture of a needle. If you are to give a tablet, then there is a picture of a tablet. It makes it very clear what you are to give. (Fredrik)

Another supportive feature mentioned by participants was the keyword-based structure of the care plans, which they could use as a checklist when checking on their patients:

There is, for example, a care plan that is called "preoperative care," and we open it for everyone that is going to be operated. And there, there is a keyword for blood group, basic test, sampling, double shower with disinfectant, nutritional drink, so it is a nice checklist that you can fill in. [...] It is an excellent support. (Nina)

Relief

Relief is used here to describe the experience of enjoying a reduction in workload. In this paper, we define relief as participants' appraisal of doing less of a task. This appraisal has to be distinguished from easy goal accomplishment, associated with joy, although the two are not mutually exclusive (ie, experiences could be coded with both relief and joy). Relief's defining element is its association with the removal of stress or discomfort (see Table 2). Here, the decrease in workload is connected with a reduction in two activities that could be strain-inducing for nurses: documenting and making (and receiving) phone calls. This aspect of removed strain is particularly visible in the following quote:

Before, [like our parallel ward, we used to] document catheters for administration and drainage, nasogastric tubes, different drainages, tubes, wound catheters and so on. But it leads to so much duplicate documentation, so we took away everything that was drainage and only have administration there. (Nina)

This reduction in (duplicate) documentation was enabled by IT training provided by management—a mandatory, ward-level training session held by the nurse responsible for documentation. The stimulus for the reduction in phone calls was participants' ability to communicate with others asynchronously, in writing, through IT systems. For example, one participant explained that they now communicated with the municipality's home care team via a chat function. Another participant described how she used a cloud-stored excel file to communicate with the anesthetists:

It is an Excel file in which only I can go in and make changes. I write if it is time for a child to start to get narcosis then and some specific treatment. [...] And [the team of anesthetists] are invited by me to get to read it. So they can only read and here it is the team of anesthetists who can read it. [...] That way, we don't need to call each other. (Estelle, FG2)

Confidence

Confidence here refers to the experience of being certain of one's ability to accomplish one's work. We have associated

confidence with two appraisals present in participants' stories. The first one is *knowing what the situation is and what has to be done*: nurses feel they have a solid understanding of both patient status and the treatment that is to be administered. In participants' stories, the convenience of information access played a key role in bringing about this appraisal. Indeed, in multiple segments, quick and easy access to information was associated with nurses' appraisal of getting cognitive support from the system as they felt it provided them with a good overview of the patient's status and needs:

When you enter the blood pressure, you get a pretty good overview of how the patients' different... It can be blood pressure or any such parameter that appears, and it tells me quite a lot. (Anna-Karin)

Access to past patient status and treatment, peripheral patient information such as referrals, and information about diseases and/or clinical routines was another recurring stimulus in participants' stories related to the appraisal of *knowing what the situation is and what has to be done*:

It is also good to be able to see if referrals have been sent to radiology, so that even I can go in and see what has actually been written, what was the reason for sending this referral to radiology. [...] This way, you know if you also need to do any preparations, because then you know, if you haven't heard the physician say what was to be done, so maybe it is hard to understand, why is this X-ray going to be done? (Magdalena)

Interestingly, some participants also connected this access to a broad scope of patient and clinical information and the corresponding deepened understanding of patient status with the provision of better care. This included, for example, avoiding a clinical incident thanks to spotting an oversight in a referral, more accurate monitoring of fluid intake and changes in patient status, as well as preventively dispensing pain killers so as to have them ready should the patient need them.

The second appraisal we found in our analysis is the idea of *mastering the system*. This appraisal has to do with knowing how to use the system, including where to find or document what information. Several participants mentioned support from colleagues and IT training provided by management as stimuli of their IT-related knowledge and confidence with IT use. In our data, support from colleagues usually took the form of verbal hints or guidance facilitating system use:

I have learned lots from colleagues. Someone is like, "but I have found that [you can do that]", and so someone else is like, "but we don't do it like this, we do it like that." So we learn a lot from each other. I don't think I have ever looked in any manual or Googled. I think I have never sought help in Cosmic [the EHR], Cosmic support or anything. Most often, I ask colleagues... And usually there is someone who knows how it works. (Lisa)

A few participants also stressed the importance of everyone working toward a shared documentation routine (at least at the ward level) in enabling certainty about where to document and find information in the systems. We here consider individual nurses' engagement toward shared documentation rules as a form of collegial support. Information technology training provided by management could, for example, take the form of a ward-level training session held by the nurse responsible for electronic documentation that made use of fictive but realistic patient data.

Relaxation

We define relaxation in this study as the experience of being free from mental concerns. In our data, we identified two different appraisals related to relaxation. The first one is that *there is no or little opportunity for mistakes or omissions*. This particular appraisal was mainly brought about by an appraisal of getting cognitive support from the system. Here again, this appraisal could be connected with the keyword-based structure of the care plans, which enabled nurses to use them as checklists:

Care plans have keywords... My part is in keywords. It's good that we don't miss anything, considering what would be optimal for just that type of [condition], why the patients are here. (Josefin)

It could, however, also be associated with different warnings issued by the system in case of omission, such as a missed medication administration, or (potential) mistake, for example, an interaction between prescribed medications:

In the medication list, it turns red when you have missed something. And it's very good. Because maybe you go in to look at something else and, "oh, I've forgotten to give this one" or "I have forgotten this infusion." Then you see it at once. It is red and at the top of the list. So that's very good I think. (Lisa)

We cannot have all medications in our head. [...] So it's very good that we get this extra warning, about how medications interact with each other. Especially in the medication lists where patients have up to 20 medications sometimes. Then it's super nice to know that, "okay, here the system is issuing a warning because these medications don't go well together," then we can double check that. "We must have them there, we must have them at the same times." We get that for free from the list of medications. We didn't get that before. (Nina)

Another appraisal related to relaxation was *assured access to patient information*. The central notion here is that any digitally recorded patient information, no matter how old, is safely stored in, and easily retrievable from, the system. Nurses thus feel that computerized information storage and access protect information from becoming lost or unavailable and guarantee them access to that information whenever they should need it.

What is good with all the computerized systems is that it is quite easy to get into them, you can go back and see, “what did I write long, long ago?,” for example. It stays put forever. You don't need to . . . scan paper in some way to some kind of collective archive. So [IT] definitely has a meaningfulness in that [the information] is always preserved and is pretty easy to retrieve all things considered. (Anna-Karin)

DISCUSSION

There is a solid body of research on the negative impacts of work-related IT use on hospital nurses and their work.^{4-9,11-13} However, the positive impacts of IT use on nurses' well-being at work are less well understood. In this study, we have sought to fill this gap by taking an in-depth look at ward nurses' positive work experiences involving IT use. We identified the appraisals at the heart of these experiences, associated these appraisals with their corresponding emotions based on design literature,²³ and mapped them onto the stimuli enabling them (see Figure 1 for an overview). To our knowledge, this is the first study that shows the ways in which IT use can foster nurses' experience of positive emotions at work. As positive affect is just as important an aspect of well-being as low negative affect,^{1,20} this knowledge can support healthcare organizations in updating their IT infrastructure and processes in a way that will foster nurses' well-being at work.

The four emotions we identified in nurses' positive experiences with work-related IT use are joy, relief, confidence, and relaxation. Joy is here attached to the appraisal of easy goal accomplishment, and relief to the appraisal of doing less of a (laborious or disruptive) task. Effortlessness is thus a common theme across these two appraisals and their associated emotions. Confidence is connected with the appraisals of knowing what the situation is and what has to be done and mastering the system, and relaxation, with the appraisals of reduced risk for mistakes and assured access to patient information. The common theme here is a form of certainty and (re)assurance, which we can associate with a sense of security. These four positive emotions and their associated appraisals can thus be brought down to two main experiential components: effortlessness and security.

Interestingly, we can make a parallel between relaxation and the “peace of mind” evoked by Burkoski et al.⁴ In their article, nurses refer to IT as a “safety net” preventing medical errors. This very same notion is reflected in the first appraisal we associated with relaxation: reduced risk for omissions and mistakes. Nurses' appraisal of IT's beneficial role in the prevention of mistakes has also been brought up in other studies,^{8,9} although they do not discuss its impact on nurses' emotional experience of work. Nonetheless, this common finding across different studies reinforces the suggestion that a sense of security/safety is central to nurses' positive experience of IT use.

Among the four emotions of joy, relief, confidence, and relaxation, relief stands out due to its particular nature. Indeed, unlike joy, confidence, and relaxation, relief is tied to the memory of a previous state (with a higher degree of discomfort). This suggests that it is not a positive emotion that healthcare organizations should strive to foster, but rather an indication that, from a perspective of nurses' well-being, the changes in the IT systems and processes of an organization are going in the right direction. Joy, confidence, and relaxation are the emotions organizations should aim to induce because they are, unlike relief, firmly rooted in the appraisal of an unequivocally positive present state of affairs.

When it comes to stimuli of positive emotions, we identified eight different IT-related factors. Some of them are mentioned in the literature: the ability to conveniently access information,^{5,9,15,16} support from colleagues,⁴ and IT training provided by management,⁴ for instance. (It is also worth pointing out that some researchers^{9,19} recommend management-provided training to improve nurses' experience of IT use.) Access to a broad scope of patient information^{8,10,16,18,19} is also mentioned in some studies, although access to clinical information does not seem to be included. The literature also mentions efficient communication with other health providers,^{5,9} which may, at least to some extent, be associated with our stimulus “communicating asynchronously via IT systems.” Nurses' appraisal of getting cognitive support from the system is not explicitly mentioned as a category in the literature, although some studies^{4,9} do mention that warnings issued by the system contribute to nurses' positive experience of IT, in particular to their appraisal of IT as increasing patient safety.

Our stimulus category of getting support from the system includes, however, more than warnings. We found that features such as keyword-based care plan structure and good overview of patient status were also experienced by nurses as a form of cognitive support. This is important, because getting cognitive support from the system is a central stimulus in our findings. Indeed, it contributes to three different appraisals and emotions: easy goal accomplishment (joy), knowing what the situation is and what has to be done (confidence), and reduced risk for mistakes and omissions (relaxation). Another important element is that nurses accessing information conveniently seems to contribute to their getting cognitive support from the system, especially in relation to confidence/knowing what the situation is and what has to be done. Indeed, participants associated this convenient access to information with being provided with a good overview of patient status by the system. Finally, it is noteworthy to stress that convenient access to information had two antecedents that do not seem to be mentioned in the literature: shared documentation routines and the ability to customize the system.

One direct implication for practice is that healthcare organizations should strive to reinforce nurses' experience of getting cognitive support from the system(s). This entails making access to both patient and clinical information as convenient as possible, which can be achieved by allowing users to customize certain system features, such as navigation menus. Another way to facilitate information access is to help wards develop shared documentation routines, so that everyone knows where to document and find specific pieces of information.

Future research should further examine the association between the found appraisals and emotions and investigate the degree to which nurses experience these appraisals and emotions in connection with work-related IT use. It should also investigate the potential correlation between IT-related emotions and nurses' well-being at work.

Limitations

We used previous research on emotions in human-product interactions to connect appraisals, defined through a data-driven, interpretive approach, with specific positive emotions. As emotions can be defined in different ways in different contexts by different authors, it is important to resort to the specific definitions we use for each emotion when relating our findings to those of other studies. We have not established the degree to which participants would identify with the emotion terms and definitions we have selected. We resorted to this theory-driven approach because our participants struggled with putting words on their emotional states. Previous research suggests that this is a common difficulty, especially when it comes to positive emotions.²³ Finally, we did not examine the frequency with which nurses experienced the defined appraisals and emotions nor the degree of emotional arousal (ie, high or low) associated with the recounted positive experiences. Our findings paint a picture of the positive impact (in terms of appraisals and emotions) that IT can have on nurses' experience of work, but they do not quantify this impact in any way.

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