# Health Care Categories have Politics too: Unpacking the Managerial Agendas of Electronic Triage Systems

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**Abstract.** While investigating the resistance to the electronic triage system, ETRIAGE, at the emergency department of British Columbia Children's Hospital, we revisit the well-known CSCW-debate about THE COORDINATOR concerning the politics of standardized categories. Examining the history as well as the design of ETRIAGE, we reveal four basic assumptions about triage work in emergency departments, which are reflected in the design of the ETRIAGE application and related to the managerial agenda of controlling costs in hospitals. We find that ETRIAGE has an embedded surveillance-capability, which challenges the professional authority of nurses' work and removes discretion from the individual. We argue that the resistance towards ETRIAGE should be understood in terms of experienced nurses' disputing the assumptions about their professional practice that are embodied within such systems rather than general resistance to change or resistance to technology.

## Introduction

Over two decades ago there was a huge debate within the computer supported co-operative work community about the role, use, and impact of standardized categories embedded in collaborative technologies. The discussion centred upon the collaborative communication technology THE COORDINATOR, designed by researchers Terry Winograd and Fernando Flores (Winograd and Flores, 1986). What was special about THE COORDINATOR was that the design was based on the ontology

of speech acts proposed by Searle (Searle, 1979). THE COORDINATOR was developed by encoding and applying the standardized structures of speech act theory directly into the user interface.

> "By teaching people an ontology of linguistic action, grounded in simple, universal distinctions such as those of requesting and promising, we find that they become more aware of these distinctions in their everyday work and life situations. They can simplify their dealings with others, reduce time and effort spent in conversations that do not result in action, and generally manage actions in a less panicked, confused atmosphere" (Flores et al., 1988, p. 158).

Suchman (1994) subsequently argued that applying standardized categories to collaborative technologies carried an agenda of discipline and control over members' action. Drawing on the work of Winner (1986), Suchman argued that THE COORDINATOR should not only be evaluated on its efficiency, productivity, and positive and negative side effects, but also in terms of how the application embodied specific forms of power and authority. It was argued that designers of technology not only design artefacts but also design organizations by embedding categories which constrain some work practices while enabling others, and that, by embedding speech act theory in its design, THE COORDINATOR became a device for social control. Suchman (1994) suggested that, in addition to investigating how artefacts support situated actions, we should also investigate how artefacts are themselves devices of social control that inscribe and encode organizational members' intentions by applying standardized categories for action.

We find the debate about THE COORDINATOR remains relevant today when investigating collaborative technologies in health care. Overcrowding in hospital emergency departments (EDs) is one of the major challenges facing health care in Canada (Ospina et al., 2006). With issues of long waiting times in EDs on the political agenda, it has been claimed that there is an urgent need to ensure consistent and comparable data collection between EDs (Rowe, Bond, Ospina, Blitz, Afilalo et al., 2006). To address this perceived need, a team of academic physicians in Canada has designed and implemented ETRIAGE: an electronic triage application designed to collect data during patients' triage examinations in emergency departments (Smith, 2005). The ETRIAGE application incorporates the national scale for triaging patients in Canada, the Canadian Triage Acuity Score (CTAS), in such a way that when nurses select a patient's chief complaint from a list, ETRIAGE requires the nurse to enter particular data in the exact manner established by the CTAS protocol. Other examples of standardized triage work also exist outside Canada, e.g., the Norwegian Index for Medical Emergency Assistance (Tjora, 2000).

ETRIAGE provides decision support for nurses triaging patients by using patients' chief complaints to generate a template of data fields and then using the data entered into these fields to generate acuity levels. By applying standardized categories for action (in this case the mapping of chief complaints both to field entries and to acuity scores), the designers have inscribed and encoded how nurses' intentions *should* be acted out according to rules and protocols that are

built into the construction of the ETRIAGE application. Designs of IT-applications based upon idealized, rationalistic, and non-empirical views of healthcare work have been detected in previous studies as one of the key challenges of health care technologies (Goorman and Berg, 2000; Heath et al., 2000; Tjora, 2000).

In 2004, ETRIAGE was implemented in the emergency department at British Columbia Children's Hospital, Vancouver, Canada. After 18 months of use, the system was withdrawn. The reasons were that experienced triage nurses had found the inscribed categories embedded in the program problematic, that the use of the program had increased time required to triage, and that patients had been placed at risk during a busy flu season (Balka and Whitehouse, 2007).

In this paper we consider why the embedded categorization of ETRIAGE was perceived as obtrusive to nurses' triage practices. We investigate the characteristics and meanings of ETRIAGE by examining its history as well as the political relationships embedded in the software. Our study suggests that the design of ETRIAGE codified four assumptions about triage nurses' work, which demonstrate that the application is strongly compatible with the political agenda of standardizing triage work and less with an agenda of improving the conditions for triage nurses in emergency departments. Referring to the work of Dreyfus and Dreyfus (1986), we argue that the design of ETRIAGE decreases and limits the essential space for nurses' professional intuition and enactment of triage drift. By decreasing this space ETRIAGE becomes a device for social control forcing particular standardized procedures upon practice. Additionally, it removes the professional discretion of triage nurses by introducing impediments to the process of triaging patients. We argue this point through a discourse analysis of the journal articles published by the academic physicians who designed ETRIAGE combined with insights gained during observations of triage work and interviews with triage nurses about the introduction and withdrawal of ETRIAGE.

## Standardization and Professional Intuition

The design of ETRIAGE is based upon a standardized classification scheme of triage work: CTAS. In 1995 the Canadian Association of Emergency Physicians recommended a five-level triage scale (CTAS) and a number of rules and protocols to be applied when assessing patients entering emergency departments (Murray, 2003). The CTAS guides triage nurses in assigning a triage score to patients and sets time thresholds for when patients should be seen by physicians. For example, a patient with a triage score of 1 (most urgent) should be seen immediately, whereas a patient with a triage score of 5 (least urgent) should be seen within 2 hours.

Applying CTAS involves a number of rules and protocols that dictate how triage nurses should evaluate the complaints of the patients based upon observations

of, for example, the patient's respiration, eyes, ear/nose/throat, or skin.[1] The underlying rationale for CTAS was to distinguish between the emergencies of the patients in a more nuanced way and at the same time improve the possibilities for comparing performance across emergency departments. ETRIAGE incorporates the CTAS standard by stipulating a particular workflow for triage work and assigning acuity levels automatically. First, the triage nurse must choose a chief complaint from a nested, standardized list of chief complaints. The selected chief complaint then automatically generates a template with particular data fields related to the complaint. While examining the patient, the triage nurse enters information into the standardized template, which then calculates the acuity level.

The CSCW community has recognized for a long time that it is impossible to capture the richness of work by merely applying rational rules and protocols because work includes tacit and situated practices invisible to formal representations of work (e.g. Robinson, 1991; Schmidt and Bannon, 1992; Suchman, 1987). Designing computer supported systems requires us to pay equal attention to formal protocols as well as informal work practices. However, informal work practices have often been neglected when designing systems because they are invisible to rational models of work (Star and Strauss, 1999).

Dreyfus and Dreyfus' (1986; 1988)[2] five stages of human skill acquisition highlight the significance of professional intuition in experts' work, and can be used to explain the role and importance of the tacit, situated, and often invisible aspects of professional work. A *novice* bases actions on context-free elements, and rules, e.g., novice nurses can measure bodily outputs and decide whether they reach certain values. Through practical experience the *advanced beginner* starts to recognize situational elements, as opposed to context-free elements like distinguishing between breathing sounds indicating pneumonia from other breathing difficulties. For advanced beginners, rules for action might refer either to context-free (measures of numbers) or to situational elements (breathing sounds). *Competent* performers additionally adapt a hierarchical procedure for decision making. A competent nurse will not automatically address the patients in a prescribed order when entering a hospital ward, but will assess them based upon urgency of their needs. The *proficient* performer has highly developed perspectives on situations based upon recent events and experiences, which allows the proficient performer to recognize certain features and elements within situations as being more salient than others. The proficient performer relies upon a highly developed perspective, also referred to as "the intuitive ability to use patterns without decomposing them into component features" (Dreyfus and Dreyfus, 1986, p. 28). Professional intuition is "neither wild guessing nor supernatural inspiration, but the sort of ability we all use all the time as we go about our everyday tasks" (Ibid. p.

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[1]  For an overview of CTAS and its application, see CTAS Implementation Guidelines (http://www.caep.ca/template.asp?id=B795164082374289BBD9C1C2BF4B8D32#guidelines).

[2]  This paragraph is based primarily upon Dreyfus and Dreyfus, 1986 pp. 19-36.

29). When the proficient performer intuitively organizes a task based upon salient features and elements, the performer at the same time thinks analytically about the task at hand. Already, when a patient enters into the emergency department a proficient triage nurse *notices* without conscious decision making if the new patient can or cannot wait in line. *Experts* generally know what to do based upon mature understandings. "When things are proceeding as normally, experts don't solve problems and don't make decisions; they do what normally works" (Dreyfus and Dreyfus, 1986, pp. 30-31). With expertise comes fluid performance: they know how to act without evaluating and comparing alternatives. Expert nurses "cannot always provide convincing, rational explanations of their intuition, but very frequently they turn out to be correct" (Dreyfus and Dreyfus, 1986, p. 34). Both the proficient performer and the expert make decisions and act without applying rules and protocols; instead they rely upon their professional intuition. Unlike a heuristically programmed computer, they do not solve problems, do not reason, or make inferences using strict rules. However, while the proficient performer sees the salient features and acts, experts just act.

This distinction between professional intuition used by highly experienced triage nurses and the rules and protocols which can be programmed within electronic systems raises questions about the whole foundation on which electronic triage is constructed. It raises the question of whether it is at all possible to construct decision support for triage work because the enforced categories represent only aspects of triage decisions-making that can be captured by rules and protocols. It also raises questions about whether decision support applications that embed rules and protocols will be useful in the professional work of experienced triage nurses when, in their work, they do not rely directly upon rules, but integrate rules into their actions constituted as professional intuition.[3] Unfortunately, this interplay between applying rules and using professional intuition is difficult even for experts to articulate.

Usually we do not consider whether a given technical application built upon a particular classification scheme has been designed in such a way that it produces a specific set of consequences for practice. However, technology is not a neutral tool; thus we must investigate and recognize the political dimensions of the devices (Winner, 1986). Standardization makes it theoretically possible to monitor deviations from anticipated workflows, but in a manner that fails to take the continuous exception-handling of work into account. Standardized categories do not have the power to capture the invisible, but often critically important, aspects of work. Standardization of nurses' work reflects a shift back to a narrow biomedical view of patients and neglects the holistic perspective of nursing, thereby reducing the professional discretion nurses have worked so hard to gain (Timmons, 2003). When constructing a classification of nurses' work, including the 'soft' tasks,

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[3]    Rules can be used prescriptively or as guidelines. Prescriptive use of rules forces standardization. The use of rules as guidelines introduces a standard (rather than standardizing practice).

such as talking to patients and making them feel good, we run the risk of over-specifying what nurses *should* do, which can take discretion away from the individual (Bowker and Star, 2002). Thus, building categories to capture the richness of collaboration, including the informal aspects of work, brings a risk of control and surveillance (Suchman, 1994).

Recognizing the political dimensions of the design of technical applications does not necessarily reflect malicious intentions on the part of designers as much as it may reflect narrow conceptions of design work that do not pay attention to how system design changes may constrain work practices. However, although poorly designed systems may not flow from malicious intentions, it is important to reveal the political dimensions of technical applications because design choices tend to be fixed within the final artefact and therefore have huge implications for the practice in which a design is implemented. When developing new designs (e.g., electronic triage systems), it is important to recognize the flexibility within former designs (triage paper forms) in order to ensure that important aspects of flexibility of work are preserved when work is computerized. When investigating the basic assumptions behind particular electronic systems, we develop insights about whether these important aspects of flexibility are embedded or neglected within the design.

## Unpacking Electronic Triage Work

Seventy-four-year-old Dorothy Madden died in a Winnipeg Emergency Department in 2003. After waiting six hours without seeing a physician and without being reassessed she went into cardiac arrest as a result of a heart attack she had suffered three days earlier (EmergencyCareTaskForce, 2004).

Triage is the process patients go through when they enter the emergency room and are assessed according to the urgency of their need for care. The word *triage* is a French verb meaning 'to sort.' In a medical care context, triage refers to "the process of sorting people based on their need for immediate medical treatment as compared to their chance of benefiting from such care. Triage is done in emergency rooms, disasters and wars when limited medical resources must be allocated to maximize the number of survivors."[4] Triage work requires complex knowledge about humans and symptoms. For this reason, triage is only conducted by highly experienced nurses who have been specially trained.

Media coverage of episodes such as Dorothy Madden's death (Eggertson, 2004; News, 2003) increased the public's interest in overcrowding within emergency departments in Canada and placed greater focus on the activity of triage. Following several negative media stories about long waits in emergency depart-

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[4]    MedicineNet.com http://www.medterms.com/script/main/art.asp?articlekey=16736 retrieved on May 24, 2007.

ments, the Canadian Agency for Drugs and Technologies in Health (CADTH) published four reports in 2006 concerned with the issue of ED overcrowding (Bond et al., 2006; Ospina et al., 2006; Rowe, Bond, Ospina, Blitz, Afilalo et al., 2006; Rowe, Bond, Ospina, Blitz, Schull et al., 2006). The main conclusion of these reports is that "although there is a growing concern about ED overcrowding, there is currently no consistent standard for measuring this phenomenon" (Ospina et al., 2006, p. iii).

The series of reports commissioned by CADTH found that (1) there is a lack of standard methods for measuring overcrowding in EDs (Ospina et al., 2006); (2) the use of inconsistent methods of acquiring, collecting, and defining data in EDs creates a confusing picture of the problems of overcrowding (Rowe, Bond, Ospina, Blitz, Schull et al., 2006); (3) "overcrowding can be defined as a situation where the demand for emergency services exceeds the ability to provide care in a reasonable amount of time"; and (4) sixty-two percent of ED directors reported that overcrowding was a severe problem (Rowe, Bond, Ospina, Blitz, Afilalo et al., 2006, p. iii). Finally, (5) it was found that there exists a need for better reporting about the settings, characteristics, and outcome measures of treatments, in order "to improve the process of synthesizing evidence on interventions to reduce overcrowding" and support evaluation of the effect of various interventions (Bond et al., 2006, p. v).

It is widely claimed that improving health care in emergency departments is about reducing overcrowding, and determining the most effective strategies for reducing overcrowding requires the ability to compare initiatives and interventions at an institutional or national level. Meaningful comparisons across institutions, in turn, require collection and reporting of standardized data. Currently, many EDs do not acquire and collect standardized data, making it difficult to measure ED overcrowding. In this context, software that promises to deliver standardized data about ED waiting times appeals to management.

Having been endorsed as a national standard by the Canadian Association of Emergency Physicians (CAEP) and the National Emergency Nurses' Affiliation, CTAS plays an important role in the design, construction, and implementation of information systems used in EDs in Canada. The CAEP subsequently proposed a national standard data set for all emergency department information systems that included as one of the mandatory elements a CTAS score (Innes et al., 2001).

## ᴇTRIAGE at Children's Hospital

"People would walk in the door (…) we would just do an initial assessment, saying okay, they are safe to wait, and then over 90 minutes [would go by] before they got back to triage, which is totally unacceptable. And the nurses weren't feeling good about making people wait that long" (Interviewee from the ED at Children's hospital).

In 2002, a decision was made to acquire ETRIAGE in the ED of the Children's Hospital in British Columbia. It was implemented in 2004 and used by triage nurses for 18 months (Balka and Whitehouse, 2007). In 2006, amidst complaints from the staff that the system slowed down the process of triaging, a decision was made to discontinue the use of ETRIAGE. EDs are hectic and chaotic environments. Triage nurses are continually interrupted in their work. New patients arrive at the triage desk while the triage nurse is triaging other patients. Hence nurses must have mechanisms for interrupting triage interviews in order to assess whether or not the new patient requires more immediate care than the first one. In turn, the nurse may be required temporarily to set aside the first interview in order to attend to the more immediate needs of the second patient.

> "So in high volume times, when you're continually stopping, using the pediatric assessment triangle, assessing whether they can wait, going back to your patient… it's so difficult to stay focused. You've got a sick person here, you've got four people waiting at the door" (Interviewee from Children's Hospital).

Since triaging requires the triage nurse to view the urgency of a patient in relation to the whole resource situation in the ED (e.g., how many patients of what level of urgency are waiting, how long the queue is in different parts of the ED), nurses conduct workarounds. For example, a patient whose clinical circumstances warrant assignment of a score of 4 might be assigned a 3 if the queue is particularly long in the non-urgent treatment area of the ED and the line is short in the urgent care area (where patients assigned a 1,2 or 3 are treated). There are also reported examples where the duty nurses assigned a score of 3 instead of 2 in situations where the CTAS protocol would recommend 2 (Dong et al., 2005).

> "For example, an LOU 3 [CTAS 3] is your typical patient who comes in. Vital signs may be a little abnormal, gastro problems, a little dehydrated, and a mild fever. So it is a Level 3, and according to the CTAS they needed a reassessment every half an hour. However, after you've done a full assessment on the patient, he or she barely gets through registration before it's half an hour. You also have your other three patients to reassess and have interventions or whatever, so you're unlikely to get back to the LOU 3 patient for reassessment in 30 minutes, so it's really tough work to meet the guidelines" (interviewee from Children's Hospital).

The pre-ETRIAGE, paper-based system allowed nurses to assign a higher or lower score than might have been strictly warranted in order to manage the traffic flow between the two sides of the emergency department: the fast track (for CTAS score 4 and 5) and the acute area (for score of 1, 2 or 3). This process of 'under' or 'over' triaging is a well-know phenomenon, also referred to as "triage drift" (Dong et al., 2005). When ETRIAGE was introduced at Children's Hospital, the underlying classification system embedded in the software was a poor match for existing work practices, slowed work down, and constrained triage nurses from using their professional intuition and enacting triage drift. The computer-generated CTAS score also discouraged triage drift, making workarounds to smooth the flow of patients through the ED more difficult.

One of the main problems was the mismatch between the assumptions about workflow embedded within ETRIAGE and the logic of triage interviews at the Children's Hospital. Both the previous and current paper-based triage systems allow nurses to record information easily in check boxes in the order symptoms are presented to them. In contrast, the electronic triage system required the nurse to scroll down to the lower right-hand corner of the screen to a free text field connected to nested pull-down menus, and here the main examinations of the nurse are recorded. This process interrupted the patient's or parent's description of the patient's history by complicating the task of documenting examinations done at triage. Specifically, ETRIAGE required triage nurses to begin by selecting a chief complaint, which would then trigger a secondary template stipulating the kind of examinations the nurse should conduct related to the particular complaint specified. This differed from the paper-based system in which the nurses usually would listen to the patient before deciding what the chief complaint was. Some nurses felt that ETRIAGE also focused more on data input than assessment, whereas the paper-based system was more focused on the triage practice than on generating a complete data set in a prescribed order.

Applying the CTAS guidelines to triage practice by embedding them within ETRIAGE increased the amount of information documented on each patient, thereby adding time to the triage interviews. Some of these extra fields were perceived as improvements on triage practice by the nurses (e.g., the percentage of records that had complete vital signs recorded went up), whereas other fields were perceived as extraneous. For example, a SARS screen would pop up when typing anything connected to respiratory complaints, which is perhaps vital when in the midst of a known international outbreak, but frustrating the other 350 days of the year when no SARS outbreaks exist. Also, the electronic input forms included fields (such as a field indicating whether or not a patient had a tetanus shot) which may have been suitable for making comparisons between EDs at a national level, but were not appropriate in the local context because such records are not monitored by the emergency department, rather they are maintained in immunization records.

Other shortcomings of ETRIAGE included an inability to document and describe symptoms in the more nuanced manner appropriate for a pediatric population. For example, although parents of babies often come into the ED distraught because their child has been crying for a long time and triage nurses often wrote "crying baby" as a presenting symptom on paper forms, this common complaint was not embedded in the ETRIAGE classification system of presenting complaints. Consequently, triage nurses had to capture this complaint by selecting the category "altered level of consciousness", which is hardly the same as a crying baby. Moreover, the CTAS classification scheme did not reflect local terminology or practices and in some cases reflected medical diagnoses (such as asthma) rather than presenting complaint or symptom (such as wheeze). Other problems associ-

ated with the entry fields included difficulty in knowing which fields were mandatory and which fields were optional and could be bypassed.

Perhaps most problematic of all was the inability to report upon more than one chief complaint. In many cases patients presented more than one complaint, such as an epileptic patient who had a seizure which caused a laceration on his head. In the paper-based system both complaints would be recorded on the triage form as being equally important. However, in ETRIAGE it was only possible to report upon one complaint. This meant that the triage nurse had to write the second complaint and connected examinations in the small field for free text in the lower right-hand corner of the user interface. When printing the form, the second complaint, which might be essential to the overall treatment, was less obvious when glancing at the form. Lastly, the mandatory fields were problematic. If these were left empty in the ETRIAGE form, the system would not print the form, effectively forcing nurses to enter mandatory information even when this was perceived by the nurses as not directly relevant to the complaint.

## Basic Assumptions behind the Design of ETRIAGE

Examining the design and discourse of ETRIAGE provides insights about the problems that have occurred with its use. What makes the cases of THE COORDINATOR and ETRIAGE unique in this matter is that both systems were designed by academics who publish their research connected to their IT-systems, thus providing us with the opportunity to examine how the designers themselves articulate their IT-systems while identifying the discourse of design embedded within the systems. THE COORDINATOR was designed by CSCW researchers, whereas ETRIAGE was designed by academic physicians publishing in academic emergency journals. An analysis of the discourse surrounding ETRIAGE in press releases, journal articles, and other written materials constructed by the academic physicians provides insights about the underlying goals the ETRIAGE system was constructed to meet.

Below we identify the discourse reflected within the writings of the designers about ETRIAGE, a discourse which is embedded within the design and transforms the work practices of the triage nurses in particular ways. Our analysis revealed four basic and interlinked assumptions around which ETRIAGE was built:

(1)   The triage process is objective and can be reduced to a set of rules and protocols;
(2)   Triage work can be understood out of its specified context;
(3)   Nurses do not do their work properly; and
(4)   ETRIAGE is designed to support management.

Each of these assumptions is addressed below:

1. ETRIAGE *is designed upon the assumption that triage is objective and can be reduced to a set of rules and protocols.* ETRIAGE is designed to follow rules and protocols for conducting triage based upon the CTAS standard. The application "requires the user to select from a standardized complaint set, which generates a complaint-specific CTAS-based template displaying all appropriate discriminators to assist the user in assigning the appropriate triage level" (Dong et al., 2006b, p. 503). ETRIAGE structures the interaction with the patients by displaying specific discriminators depending on the chief complaint, while calculating the CTAS level of particular patients on the basis of the input from the triage nurse. The basic assumption behind this design is that it is possible to produce a standardized complaint set and a number of CTAS-based complaint templates. Designing such an application requires that the designers believe that the standards can be applied in such a concrete way as to warrant inclusion in the user interface in a manner that stipulates specific work practices.

The discourse of ETRIAGE reflects an awareness of the existence of situations in which the automatically generated triage scores may differ from the clinical judgment of the triage nurse. In this way the important distinction between protocols and clinical judgment in triage work is acknowledged by the designers. The problem is 'solved' within ETRIAGE by "not only permit[ting] but also *encourage[ing]* overrides when the clinical impression requires it" (Dong et al., 2006b, p. 273, our emphasis). However, "the reason for the override must be recorded *before continuing*" (Dong et al., 2005, p. 503, our emphasis). The need to justify an override and the time required to do so may discourage triage nurses from using the override feature. Indeed some evidence suggests that some nurses disliked the requirement of providing a rationale for use of the override because it made them feel as though they had made an error:

> "Because once you said override it said override in your square that had the big number, so everyone would know you'd overridden it. There was more overriding done in the beginning than later" (Interviewee from Children's Hospital).

It can also be argued that in emergency situations providing a rationale for exercising clinical judgment in favour of a pre-programmed algorithm can disrupt the work. The designers suggested that "it is expected that experienced triage staff" have "greater confidence to override the tool" (Dong et al., 2005, p. 505). It might be true that expert triage nurses will have more confidence in overriding the tool, but it is also important to realize that the exercise of professional intuition is often an automatic and unconscious process. It may be difficult to articulate why such a practice differed from rules and protocols (Dreyfus, 1988; Dreyfus and Dreyfus, 1986) because providing a rational argument for professional intuition may not be possible. Although rules may guide the assignment of triage scores, at times – and for a variety of reasons – other factors captured by tacit professional intuition are taken into account by expert triage nurses. This suggests that the assumption that triage is objective and can be reduced to a set of rules and protocols may itself

unnecessarily constrain triage nurses. There are important aspects of triage which are not objective and thus cannot be argued by referring to rules and protocols.

2. ETRIAGE *reflects the assumption that triage work can be understood out of context*. In the literature various 'tests' of the ETRIAGE application are reported (e.g., Bullard et al., 2003; Dong et al., 2004). However, the design of all of these studies reflects the authors' assumptions that triage work can be understood out of context. For example, in one study the use of ETRIAGE by a research nurse is compared to traditional triage conducted by a duty nurse within an ED (Dong et al., 2005). In this study, the two nurses triaged the same 722 patients in real-time, and later the triage data of 100 of these patients were given to an expert panel for assessments. This study reported that the agreement between the research nurse and the expert panel was higher than the agreement between the duty nurse and the expert panel (Dong et al., 2005). On this basis they conclude that triage nurses using ETRIAGE are in better agreement with a consensus standard than with nurses using 'memory-based triage.' In this study the authors also report that the major difference between the duty and research nurse assessments related to the assignment of CTAS level 2. The duty nurse only selected the sickest patients for CTAS 2 and assigned other high-risk yet stable patients to CTAS 3. The authors suggest that this difference between the duty and research nurse might be due to triage drift – "the behavior by triage nurses of subjectively 'down' or 'up' stratifying patients based on the current state of the ED environment" (Dong et al., 2005, p. 504).

The discourse of ETRIAGE views triage drift as something that should be mitigated. Dong et al. (2005, p. 502) argue that "triage decision support tools can mitigate this drift, which has administrative implications for EDs." However, it is important to remember that "rates by triage level are not objectives or standards," but rather the score is "a maker of illness severity and a 'sentinel event' that will reveal differences in triage standards between hospitals and highlight 'triage drift' over time" (Jiménez et al., 2003, p. 9). Triage drift is about triaging according to the *context*; it is about adjusting the rules and protocols to the particular situation at a specific point in time. The importance of context within triage work is embedded within the very definition of triage as a system to ration limited medical resources when the number of injured needing care exceeds the resources available to perform care so as to treat those patients most in need of treatment who are able to benefit first. This means that triage nurses always have to take the limited medical resources available, the context, into account when triaging. The importance of the context in assigning scores is further supported by empirical observations of the work practices in triage work where, in some instances, scores inconsistent with the CTAS are deliberately recorded and altered as a means of improving flow through the facility by insuring that staff on one side are not sitting idle while staff on the other side are over-extended (Balka, 2006).

One must assume that triage can be evaluated independently of the context, when triage work is evaluated by applying a 'gold standard' produced by an expert panel reviewing textual data without any connection to the actual context in which the triage was conducted (or even meeting with the patients face to face) as a measurement for whether the ETRIAGE application provided 'better assessment' than traditional triage. When securing funding for the unit is based upon documentation of patient loads in relation to levels of acuity (as measured through CTAS scores), triage drift might have serious consequences for the ward. However, the main purpose of triage work must be kept in mind when evaluating triage practices – namely, that triage prioritizes patients accordantly to existing severity of complaint and availability of resources. From this perspective, triage drift should be viewed as an essential workaround that helps maintain a functional ED.

3. ETRIAGE *reflects the assumption that nurses do not do their work properly.* This assumption follows from the above assumptions because discourse surrounding the use of ETRIAGE suggests that triage work is fundamentally objective and can therefore be reduced to a set of rules and protocols, and when nurses 'adjust' the rules according to the particular context (triage drift), they are not doing their job properly. This assumption about nurses' work is articulated as the problem with 'traditional triage methods' and a 'reliance on memory' which 'often is flawed' by 'lack of time and ability to recall the guidelines' (Dong et al., 2006a, p. 269; Dong et al., 2005, p. 502). In busy and crowded emergency rooms it cannot be 'expected' that nurses can 'accurately recall the entire' CTAS guidelines 'from memory,' a result of which is 'subjectivity and inconsistency in the triage process' (Dong et al., 2006b; Dong et al., 2005) as well as 'inappropriate assignment of lower or higher' scores (Smith, 2005). While "memory and experience are invaluable", using "ETRIAGE takes the guess work out of the equation" (Smith, 2005, p. 1). The discourse of ETRIAGE reflects a questioning of the nurses' qualifications for conducting triage work. Dong et al. (2005) argue that the length (eleven pages) of the original document defining the characteristics of CTAS is too long for nurses to read and remember. However, one could argue that triage work is much more complicated than what can be summarized in eleven pages. ETRIAGE was built to control nurses' work.

4. ETRIAGE *is designed to support management.* The goal of ETRIAGE is to enable the possibility for comparison between EDs across Canada.

> "One major benefit is that we are able to improve triage reliability between RNs', added Dr Michael Bullard, a professor of emergency medicine at the U of A and one of the developers of eTriage. 'We are now better able to compare apples to apples when we look at the types of complaints and levels of acuity among patients in our emergency departments'" (Smith, 2005, p. 1).

In other words, this need for comparison is linked directly to the challenge of overcrowding in EDs. It is claimed that the solution of overcrowding requires standardized data collection to resolve 'the serious barriers' to meaningful com-

parison between EDs across the country (Rowe, Bond, Ospina, Blitz, Schull et al., 2006). It is also argued that from a quality-improvement perspective ETRIAGE will "allow monitoring of CTAS guidelines" and that CTAS has demonstrated the ability "to predict ED resources utilization" (Dong et al., 2005, p. 505-506). In this way the discourse about ETRIAGE has long been dominated by administrative and managerial agendas comprising the surveillance of nurses' work and control of economic resources. Evidence of the managerial needs that ETRIAGE data help fill can be seen in attempts to assign costs to the treatment of patients of different acuity levels:

> "Compared with CTAS 3, the odds ratios for specialist consultation, CT scan, and admission were significantly higher in CTAS 1 and CTAS 2, and lower in CTAS 4 and 5 ($p<0.001$). Compared with CTAS 2-5 combined, the odds ratio for death in CTAS 1 was 664.18 ($p<0.001$). The length of stay also demonstrated significant correlation with CTAS score ($p<0.001$). Cost also correlated significantly with CTAS scores (median cost for CTAS1=\$2,690CAD, CTAS2=\$433CAD, CTAS3=\$288CAD, CTAS4=\$164CAD, and CTAS5=\$139CAD, $p<0.001$). Conclusion: eTriage demonstrates excellent predictive validity for resource utilization, patient acuity and hospital cost" (Dong et al., 2006a, p. 308).

Thus, while the ETRIAGE system may be sold as a product that will support nurses' triage work, it was designed to support administrative and managerial agendas, also referred to as the secondary purpose of health care. We are not against data collection and comparison, but rather point to the fact that if the secondary purpose is blatantly embedded within the design of the electronic systems, such systems can adversely affect the primary work of EDs: providing healthcare for sick patients. By embedding rules for the assignment of CTAS scores into software, the categorizations transform the work practices, at times to the extent of disrupting staff from utilizing workarounds and using their professional intuition enacting triage drift. Thus, while designed to enable the administrative agenda, ETRIAGE had the unintended consequence of constraining triage work practices.

## Managerial Agendas of Control

Implementing the CTAS protocol into the embedded workflows of the electronic triage system carries with it an agenda of surveillance and control of nurses' work. Using ETRIAGE altered workflows and dictated what triage nurses should do, even, at times, distracting experienced nurses from exercising their situational expertise in managing patient flow enacting triage drift. The electronic triage system for some led to a mechanical approach to triage interviews, which disturbed triage practices. Consequently, some experienced triage nurses refused to use the system during busy times, returning to paper triage because it was faster. However, although expert triage nurses often experienced ETRIAGE as constraining, nurses with less experience in triaging did not resist using the system in the same

ways. Novice triage nurses[5] often appreciated the decision support provided by the system as they went about their triage assessment because they were still in a learning situation in which their decisions were based or partly based upon context-free or situational elements. However, when novice triage nurses apply ETRIAGE there is a risk that they tend to rely upon the system instead of their professional intuition. This was evident with a triage nurse who was trained using ETRIAGE and had difficulties triaging without it.

ETRIAGE can also be used by management to regulate behavior. By requiring that in cases of triage drift the initially input CTAS scores be explicitly overridden and justified, ETRIAGE assumes the role of an all-knowing instructor monitoring triage nurses' situated behavior. For example, with ETRIAGE it is possible to produce reports about how fast nurses triage over time – each nurse can see their personal average triage time (e.g., 6 ½ or 4 ½ minutes). Measuring average time does not reflect any information about either the quality of triaging or the context (e.g., number of interruptions the triage nurse experienced), but it can be used to regulate the time an individual nurse spends on task.

Before ETRIAGE it was a natural part of the work for triage nurses to adjust their work according to the emergent situations during their shifts by enacting triage drift. In high volume times triage nurses are continually interrupted and require mechanisms for stalling some patients while triaging new patients. Triage nurses would normally assign a patient with a bone fracture a higher level in situations where the child also had diabetes so that the diabetic child would not miss a meal. Such triage drifts were an established part of the paper-based triage practice and often undertaken for medically sound reasons. Although ETRIAGE allowed such workarounds, the need to justify those was time consuming and intimidating for some nurses, thereby effectively discouraging nurses from undertaking workarounds for non-medical reasons such as smoothing workflow. However, professional intuition is an aspect of work that is often invisible, which means that you cannot apply rules and protocols and make a rational argument for its exercise; one cannot justify professional intuition (Dreyfus, 1988; Dreyfus and Dreyfus, 1986). In this way the new design artefact (electronic triage system) did not reflect the important flexibility embedded within the former design (paper-based forms). Having formalized the entries in the IT-system the designers inadvertently undermine the flexible and contingent character of the system (Heath et al., 2000).

Designing applications tightly coupled with a classification system external to the immediate work environment and making the system mandatory narrowed the space for conducting workarounds. The ETRIAGE application thereby became an

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[5]   It is important to note that a novice triage nurse is not a novice nurse - quite to the contrary. To become a triage nurse one is first educated as a nurse, typically followed by a numbers of years working as a nurse in various departments within hospitals. Then the nurse will be working within the emergency department for at least a year before starting the training to become a triage nurse.

ordering device (Suchman, 1994). So when the designers of the ETRIAGE argue
that by applying their application triage practices will not be changed (triage time
will be the same as with traditional triage) and that ETRIAGE would only provide
an additional feature, namely allowing a real-life population of a database without
any increase of staff requirements (Bullard et al., 2003), it was not acknowledged
that the application *would transform* the work of triage nurses in fundamental
ways. It was acknowledged that 'some information' might get lost, but this was
seen as a price worth paying in the interest of solving problems perceived to be
greater.

> "(...) standardized presenting complaints enable the establishment of searchable databases for
> research and administrative purpose. Taking this approach means that triage nurses will have
> to 'translate' an infinite range of actual patient descriptors into a limited number of standard
> complaints. Inevitably, some information will be lost in the process (e.g. 'I have gout' be-
> comes 'extremity pain'). This is necessary to allow meaningful information capture and subse-
> quent data analysis, but it may initially cause discomfort among nurses who are specifically
> trained to be scribes rather than translators of patient information" (Grafstein et al., 2006, p.
> 11).

By embedding the CTAS protocol within the decision support environment,
ETRIAGE was seen as a remedy for perceived flaws and inadequacies in triage
practice. Similarly, speech act theory, in the context of THE COORDINATOR, of-
fered a remedy to perceived flaws and inadequacies of communication flows
(Suchman, 1994). ETRIAGE promised management control of the complex triage
work by mitigating triage drift and taking the "guess work out of the equation"
(Smith, 2005, p. 1). Thus by inscribing formal representations of triage practice
into the design of a technical application, the designers of ETRIAGE bring the
debate about who controls nurses' work in to focus. As Suchman (1994, p. 188)
formulates it: "categorization devices are devices of social control involving con-
test between others' claims to the territories inhabited by persons or activities and
their own, internally administered forms of organization." The designers of
ETRIAGE are academic physicians claiming the territory of triage. As one nurse
articulated it: 'ETRIAGE is designed by doctors but used by nurses.' Implement-
ing ETRIAGE management replaces professional intuition enacting triage drift
with a scheme of standardized CTAS categories, administrated through ETRIAGE
in a manner that narrow the space for workarounds helping smooth the flow of
patients through the ED. Hence, just as THE COORDINATOR "promises to tame
and domesticate, to render rational and controllable the densely structured, het-
erogeneous texture of organizational life" (Suchman, 1994, p. 185), ETRIAGE
offered the promise of domestication and taming. Consciously or not, technolo-
gies present particular ways of building order and structure into the world (Win-
ner, 1986). They impose a structure that influences how people are going to work
and communicate. While THE COORDINATOR is inherently a collaborative tool
built upon a constraining and idealized model of communication, ETRIAGE is
inherently an individual tool built upon a constraining and idealized model of tri-

aging as an individual activity conducted by an individual triage nurse based upon objective criteria. However, in reality triage practice in EDs comprises highly complex collaborative activities between various emergency staff (nurses, clerks, and paramedics) managed through the use of coordinative artefacts. In this way both applications constrain human actions due to the embedded model of work. In addition, previous studies of IT in health have also identified similar constraints of the embedded model of work on nurses' work. For example, a medical index for nurses screening and provisional diagnostic work did not reflect the collaborative nature of nurses' decision making (Heath et al., 2003). Another example is the hierarchical structure of an index for medical emergency assistance, which was found to constrain the collaborative decision making of nurses in acute medical communication centers by supporting a formal model of individual decision making (Tjora, 2000).

Investigating technology requires identifying the social structures required by or compatible with the workings of a given application. It also requires revealing in which ways the embedded choices about the technology have important consequences for the form and quality of human associations (Winner, 1986). The structure imposed upon EDs by the application ETRIAGE is strongly compatible with the political agenda of comparison, standardization, and economic funding of EDs. The consequences of such comparisons are that they can reduce the professional autonomy of the nurses. In this way ETRIAGE can be seen as a device by which management establishes patterns of power and authority in the setting of EDs. Use of ETRIAGE may have ensured that the ED better met the CTAS guidelines. But, because ETRIAGE actually increased triage times, it may not result in fewer Dorothy-Madden incidents.

## Conclusion

Here we have shown that using externally imposed categories as a basis for system design heavily impacts work practices, in this case, the work of triage nurses. We have argued that such imposed categorizations of nurses' work, when encoded into a technical application, brings a risk of control and surveillance which, in turn, may lead expert nurses to resist using the software by regularly abandoning the system. Moreover, we have shed light on the political discourse concerning electronic triage systems within emergency departments in Canada and revealed how this discourse may actually have hindered the work practices of triage nurses and contributed to the problem of overcrowding instead of solving it. We have argued that designing electronic systems for triage work by applying a classification scheme based upon an idealized application of CTAS scores (as opposed to the assignment of CTAS scores in situ) carries a risk of constraining the practical actions of triage nurses, thus decreasing their ability to act on the basis of their tacit knowledge and professional intuition enacting triage drift.

We acknowledge the need to collect data for comparison and that such comparisons call for some degree of standardization. However, we argue that externally imposed categorizations may implicitly standardize human interaction and carry an agenda of control and surveillance that is likely to meet with resistance. Uncritical reinvention of work practices through standardization may take away the professional discretion and skills of triage nurses and seriously constrain triage nursing practice. Alternatively, we propose that new designs of electronic triage systems pay equal attention both to the work practices of the emergency department staff insuring that the important flexibility of former practices is preserved in new designs as well as to the agenda of data collection. We believe that these two sometimes conflicting agendas of the primary and secondary purpose of health care can co-exist within an application; however, it is not a simple task to design such an application, and currently the lack of informed knowledge of triage practices seriously constrains this development. Thus, there is an immediate need for workplace studies within emergency departments portraying the collaborative nature of triage work practices while recognizing the flexibility of existing work practices in order to ensure that essential aspects of work are preserved within new designs of technologies.

# Acknowledgments

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