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Navigating Clinical Decision Support Systems in Emergency Medical Services: Balancing Professional Judgment and Technological Integration

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Abstract

This article illustrates how clinical decision support systems (CDSS) are integrated into *clinical reasoning* and affect decision-making processes in emergency medical services (EMS). CDSS aims to assist clinical reasoning with relevant patient information and medical knowledge, facilitating decision-making. As CDSS become increasingly significant in Swedish healthcare, understanding their implementation is critical, particularly as technological innovations may reshape clinical reasoning and professionals' decision-making. The study draws on empirical data from observations and interviews with registered nurses (RNs) in a simulation project. Findings illustrate how clinical reasoning is a collective process among colleagues and how emotions and tacit knowledge are central to professional judgment. Although RNs express confidence in technical systems assisting clinical reasoning, they remain skeptical in situations requiring compromises to their judgment based on CDSS outputs. Finally, the article problematizes the effects on RNs when working with unsynchronized or insufficiently functioning technical systems.

Keywords

Professional logic, clinical reasoning, CDSS, decision-making, community of practice

Introduction

In the early 2000s comedy series *Little Britain*, a hospital receptionist always responds to clients' questions with "Computer says no." The term became popular because it visualizes the criticism of organizations and professions that blindly rely on computer-generated information for decision-making. However, it also touches on more profound concerns about how welfare institutions and professionals are increasingly bound by preprogrammed decision-making systems that are unable to empathize with or consider personal conditions.

In contemporary Western healthcare, clinical decision support systems (CDSS) have become more important as technological innovations and organizational changes toward explicit standards have become central to professionals' work (Johansson et al., 2015; Simonet, 2011). CDSS refers to health information technology designed to improve healthcare decisions by providing person-specific health information (Berner & La Lande, 2007). The primary purpose is to assist professionals' *clinical reasoning* with relevant patient data and medical knowledge, thereby improving decision-making (Sim et al., 2001). CDSS includes tools like clinical alerts, guidelines, reminders, and triage support systems that evaluate vital parameters for normal versus risk values (Sutton et al., 2020). In EMS, where time is crucial, various CDSS can accelerate and refine decision-making.

However, there is significant variation in guidelines and systems supporting decision-making. The most common are paper-based guidelines for triage or reminder and those related to clinical pathways for specific conditions. There is also a significant variation in computerized decision support systems that aid various functions from medication dosages to assessing skin changes. Based on recent research, the systems differ in design, usability, and updates. (Sutton et al., 2020). Broadly, CDSS can be grouped into two types based on how they incorporate new knowledge. The first type uses immediate patient data to generate practice-based evidence in real time, while the second relies on experts to update the system with new algorithms based on practice-based evidence (Ostropolets et al., 2020).

The 1980s marked a paradigm shift regarding the use of CDSS in decision-making processes in healthcare (Sutton et al., 2020). Despite the rapid development of CDSS in clinical decision-making processes, uncertainties remain regarding various effects on professionals, patients, and expenses. There are both optimistic interpretations and concerns about using CDSS as a means of decision-making in healthcare (Andersson Hagiwara et al., 2019). On the one hand, automated decision-making like CDSS can provide rigor and efficiency when an excessive amount of information needs to be processed and/or in stressful environments. Rather than arriving at a specific diagnosis, CDSS in EMS advises on whether a condition needs urgent

treatment. Hence, an important objective of CDSS is to assist decision-making by sorting patients toward either a "fast track" for specialist treatment or admission to a ward. A study by Hagiwara Andersson et al. (2012) shows that digital decision support in EMS can increase adherence to guidelines when compared with paper-based guidelines. However, EMS guidelines are often based on desirable outcomes that are defined by the hospital organization, making it difficult to adapt to actual situations (Andersson et al., 2019; Timmerman & Epstein, 2010). Another matter of concern is sorting the amount of so-called alerts, a consequence of the high quantity of systems in use in today's healthcare, all of which produce various warnings. Besides the apparent annoyance that a high quantity of warnings can create for professionals, a backlash may be what scholars call "alert fatigue," meaning that professionals simply pay less attention to them (Khalifa & Zabani, 2016).

While CDSS likely possesses a greater ability to integrate multiple variables to optimize medical outcomes, their use can challenge patient autonomy. The reliability of CDSS might unintentionally reduce the opportunity for patients to actively participate in their own care decisions (Berg, 1997). This tension highlights a critical balance: while CDSS can support improved decision-making, it may also introduce unintended consequences. Moreover, the expectation that CDSS can reduce biased reasoning among healthcare professionals depends heavily on the algorithms that control these systems and the quality of the information entered by professionals. Consequently, there is a risk of reproducing biased reasoning based on the program's input (Timmermans & Epstein, 2010). Additionally, while CDSS provides suggestions, healthcare professionals ultimately make the final decision.

The institutional setting also impacts the motifs of implementing CDSS (cf. Freidson, 2001). New technologies can become a tool for management to control or limit practitioners' work and autonomy. A downside of organizational reforms such as new public management (NPM), which is widely applied in Swedish healthcare, is that they reduce the scope and jurisdiction for professional decision-making (Brante et al., 2015; Gadolin, 2018). Hence, the implementation of CDSS in healthcare can also be seen as part of a general trend in Western societies toward an increase in evidence-based methods, standardization, and uniformity in professional assessments and interventions. In this sense, CDSS may reduce or rationalize professional considerations of patients' personal circumstances. This is particularly evident in EMS, where CDSS is assumed to increase equality in the assessment and treatment of patients (Andersson Hagiwara et al., 2019). Finally, CDSS can also be viewed as a means of creating more cost-effective healthcare (Lessard et al., 2010). Indeed, the objectives of improving efficiency and reducing costs have led to a decrease in the number of patients transported to hospitals, exemplifying how organizational considerations can affect patient assessment (Andersson et al., 2024; cf. Ebben et al., 2017). The use of CDSS today is more directed at sorting patients to other care services or being "home cared," hence reducing emergency admissions. As such, cost savings rather than clinical objectives are also a goal when implementing CDSS.

This article aims to examine how registered nurses (RNs) integrate CDSS into their clinical reasoning and how this integration affects decision-making processes in ambulance healthcare. The guiding questions of the study are: (1) How is CDSS integrated into work processes? (2) How does CDSS influence decision-making among RNs? The empirical material consists of observations and interviews with RNs collected during a simulation project aimed at developing and evaluating a CDSS for a prehospital estimation of sepsis risk.

Clinical reasoning as a professional logic in decision-making

Decision-making is a complex process, and professionals actively shape and reformulate the contexts in which CDSS is used (Bergquist & Rolandsson, 2022). Professionals have significant space to manage uncertainty, and their deliberations are based on experience and interaction within the staff group (Noordegraaf, 2020).

In EMS, "clinical reasoning" refers to the process of gathering, evaluating, and applying available information to make informed decisions in patient encounters (Andersson et al., 2019). This reasoning is anchored in the staff's professional judgment, guiding each step of the clinical process. In the EMS context, the complexity of clinical reasoning is heightened, as staff must navigate unpredictable and often high-stakes situations. Clinical reasoning begins before direct patient contact, based on preliminary information received before an emergency response. Throughout the encounter, staff must adapt swiftly, continuously managing and anticipating unforeseen challenges that may arise (Andersson et al., 2022; Andersson et al., 2019; Ostropolets et al., 2020). This ongoing adaptation underscores the importance of flexibility and experience in supporting effective decision-making under pressure in the EMS setting.

Although clinical reasoning is mainly conceptualized in medicine and health sciences, the research area is not unique. For example, there is extensive research on decision-making in economics, psychology and sociology. Depending on the focus, there are also focally different interpretations of decision-making, which can be summarized as either a normative approach based on guiding choices and decisions in a desirable direction or a more descriptive approach that focuses on how decisions actually take place (Puaca, 2013; Berg, 1997). Unifying the different traditions is the issue of uncertainty that characterizes decisions because of incomplete information and people's (limited) ability to evaluate information and estimate possible outcomes. In other words, uncertainty is fundamental to decision-making and raises epistemological questions about how people's deliberations are always shaped by their circumstances (Daoud & Puaca, 2011; Sayer, 2010; cf. Wacquant, 2005). This becomes explicit in emergency care, where ambulance personnel lack the opportunity to deliberate their decisions over a longer period. Instead, many times, life-threatening decisions must be made based on incomplete information and under time pressure. Under these circumstances, experience within professional groups and relationships with other professions is critical for managing uncertainties.

Professional reasoning and decisions are also closely related to organizational frameworks, such as resources and management (Freidson, 2001). Accordingly, clinical reasoning can be seen in a wider social context where professional action is embedded in bureaucratic logic and requires judgment beyond an instrumental or technocratic rationale. Professional judgment involves interpreting situations and placing them in a broader context that benefits citizens (Brante et al., 2019). This involves understanding bureaucratic order and knowing what action is possible. It involves reasoning shaped by the actors' experiences and external expectations within a specific context, forming a *community of practice* (CoP). A CoP represents a form of situated learning that occurs within professional settings, where individuals engage meaningfully with one another to develop shared knowledge and practices (Wenger, 1998). Within a CoP, knowledge is distributed across its members and functions as a form of "decision support," guiding what the group considers reasonable and appropriate (Lave & Wenger, 1991). This continuous interaction fosters the establishment and reinforcement of collective norms, values, and professional standards. Consequently, certain ideals and practices become more prominent, shaping how learning is embedded in the profession. Learning within a CoP is facilitated by a shared repertoire of concepts, routines, and practices that reflect the group's collective knowledge. Clinical reasoning and professional learning, as inherently social processes, are deeply rooted in specific contexts and shaped by the shared experiences of colleagues (Andersson et al., 2019; Koufidis et al., 2020). For instance, assessing complex situations often involves observing and emulating practices through informal learning opportunities (Eraut, 2004). Such informal learning relies heavily on tacit knowledge, which is developed through skill-based practice rather than formal routines (Gonzalez & Burwood, 2003). This interplay between formal and informal learning underscores the dynamic nature of professional development within a CoP.

CDSS—Harmonizing technology within an organizational logic

Conclusively, clinical reasoning is embedded in the context where practice takes place and where actors engage with preconceived understandings and assumptions (Trowler & Knight, 2000). However, bureaucratic organizations can limit professional discretion and reduce trust between employees and patients or clients (Johansson et al., 2015). As Evetts (2003, 2011) illustrates, this is an ongoing process where control and judgment of professional practice shift from professionals to management and administrative procedures following standardization of activities. The evaluation of work is becoming increasingly systematic, focusing on the administrative organizational structure rather than professional judgment. Accordingly it limits professional judgment, action, and legitimacy.

Like teachers and social workers, RNs can be described as welfare professions because they, in a Swedish context, generally operate in organizations of public service (Linde & Svensson, 2021). A characteristic of RNs' profession is that they exhibit some features usually attributed to traditional professions (Brante et al., 2019). For example, nurses have specialized

knowledge but may not have the same degree of autonomy or authority as doctors. Therefore, the actual ability to exercise discretion is essential for understanding RNs' professional work. Discretion is an essential decision-making mechanism when general rules are not directly applicable (cf. Bovens & Zouridis, 2002; Liljegren & Parding, 2010). However, discretion is used not only in the absence of rules but also in interpreting and tailoring broad principles to address the nuances of individual cases. It enables the adaptation of general knowledge to specific contexts. The exercise of discretion goes beyond personal judgment; it is influenced by broader social and organizational factors, shaped by the internalization of professional norms, values, and common sense (Ponnert & Svensson, 2015). This situates discretion as a dynamic process, deeply embedded within the workplace environment, specifically within a CoP, and essentially shaped by values internalized by its members. Following this, discretion is exercised collectively, with "common sense" becoming a product of the social interactions and professional learning within the community (Wenger, 1998). This perspective shifts discretion from purely personal judgment to a social, collaborative process influenced by the community's collective expertise and ethical standards. To ensure CDSS aligns with this collaborative nature, its integration into CoP requires harmonizing technology, work organization, and professional practices.

Method

The "Prehospital Decision Support for Identification of Sepsis Risk" (PreSISe-1) project (Vinnova) developed and evaluated an AI-based CDSS for early prehospital identification of sepsis risk. The project included privacy, clinical, regulatory, and legal issues. The present study is based on clinical observations of RNs specializing in ambulance care, conducted during full-scale simulations, along with group interviews held with the RNs following the simulations.[1] Four observation sessions, each lasting about 20 minutes, and two group interviews, approximately 40 minutes each, were conducted in the spring of 2021. During the simulations, the RNs were divided into pairs with their regular colleagues. One group had 10 or more years of experience, while the other had around five years. The inclusion criteria specified RNs employed in an ambulance service district in southwest Sweden who were willing to participate. In Sweden, ambulance services are part of the healthcare system and are primarily organized by the regional districts, which are responsible for both funding and operations. Each district is responsible for ambulance services within its geographical area. Both simulations and interviews were recorded, and the interviews were transcribed.

[1] The study is based on the Swedish Research Council's guidelines for good research practice (Vetenskapsrådet, 2017) and principles in the Helsinki Declaration (World Medical Association, 2017). Each participant gave consent and was informed about the study and their right to withdraw from the study without explanation. Other ethical issues related to data protection and security were addressed by adhering to the Swedish Data Protection Act (Sveriges Riksdag, 2018). No information about participants' identity or location has been included.

Based on observations and interviews, the study design provides insights into when and how decision-making takes place in a clinical setting. Choosing observations and group interviews enabled a blend of insights and targeted discussion, capturing both behaviors and nuanced, reflective responses in a controlled setting. Even though all observations are inherently influenced by the observer's framing and context, the simulation setting allows researchers to directly observe practitioner behaviors and address questions about clinical practice by analyzing real-time data in practice-like environments (Asakura et al., 2021). It also helps reduce ethical dilemmas in research, such as those in EMR settings. However, there are limitations to the insights gained through simulations, as they cannot fully replicate the complexity and unpredictability of real clinical encounters with actual patients. Simulations, while valuable for practicing technical skills and decision-making in controlled environments, often lack the nuanced dynamics of human interaction, such as emotional responses, cultural considerations, and patient-specific variability (Asakura et al., 2021). These missing elements can lead to an incomplete understanding of how clinical decisions unfold in real-world settings, where time pressures, interpersonal communication, and unforeseen complications frequently play critical roles. Using follow-up group interviews allowed us to understand not only what the RNs did but also how they thought and reasoned during decision-making. Group interviews highlighted the dynamics preceding decision-making, which were also visible during observations. Interviewing RNs alongside their daily colleagues facilitated the exploration of each other's views, thus enhancing the group dynamics crucial to decision-making in this context. This setting enabled RNs to discuss decision-making "as it happened" in emergency care, reflecting on it as a collective team process (Gibbs, 2021). Hence, a more complete understanding can be achieved regarding clinical reasoning in interactions between colleagues and how CDSS shapes the space for professional action. The approach is close to a participant-oriented approach, where experiences may impact strategies and practices after the study.

The purpose of the observations was to gain insights into what happened during the simulations. The observations were video recorded so that the material could be analyzed in more detail afterward. An observation scheme with general themes of *information exchange, the work process, dialogue*, and *managing the unexpected* guided the observations, and field notes were taken. Observing ongoing simulations enabled the mapping of subtle aspects of social interaction in patient encounters and between colleagues, such as mimicry, body language, eye contact, and verbal communication.

The structure of the interviews was thematically open, allowing the participants to start from their own concepts and providing a deeper understanding of their reflections on decision-making. The analysis began with open coding to identify all possible meaning-making elements in the material. As central categories crystallized, coding shifted to a more selective approach (Glaser, 1978) to generate meaningful categories indicating themes and patterns.

This process initially involved developing a comprehensive number of categories, which were later refined into a few central categories of *trust, relations, organization of wor*k, and *professional judgment*. The study was based on specifically selected theoretical concepts regarding clinical decision-making, and our analysis in this respect was thematically driven. We aimed to achieve a balance between a theoretically driven process for analyzing the interview transcripts and the flexibility to generate new meaningful categories based on the identified patterns (Charmaz, 2014). These patterns could explain our case and ultimately generate a revised theoretical framework for the conditions of clinical reasoning.

Our thematic analysis involved three main steps, beginning with the exploration of individual categories. From there, we created patterns between categories aimed at elucidating our specific case and constructing theoretical concepts. Through this methodological lens, we sought not only to understand the relationships between categories but also to generate deeper insights into the underlying dynamics of our research.

Results

Trust and distrust in the integration of CDSS in clinical reasoning

A key finding in the results is how various considerations of trust and distrust in CDSS are expressed in RNs' clinical reasoning. RNs' trust in CDSS is linked to the perceived benefits and whether it complements rather than hinders professional practice. When CDSS does not add value, trust in the system decreases. In time-sensitive environments, systems must support rather than obstruct patient-focused care.

> It's absolutely crucial […] if you're going to use it with the patient or in the car, then you won't do it if it takes too much focus or requires too much thought. You'll end up filling it in afterward.

There is also a fundamental distrust apparent that systems do not have the equivalent clinical overview that RNs feel they possess. The RNs exhibit strong confidence in their and other colleagues' professional judgment regarding sorting and creating meaning from a complexity of impressions, and that their capacity exceeds that of technology. Since professional judgment is perceived as more nuanced and can weigh more parameters, there is a clear sense of distrust that CDSS may "take over" and/or replace the RNs' professional judgment.

> It's a delicate matter. What provides guidance, and what provides blocking? Maybe it's something completely different, but all of a sudden, you get sepsis, and then you're completely on that track instead, and maybe, you miss the fact that the patient is incompensated or that it's heart failure or even STEMI [ST-elevation myocardial infarction]. So, it's dangerous to lock yourself in one direction, really.

However, the material also shows a belief that different systems can assist clinical reasoning that precedes decision-making. Clinical reasoning involves gathering and evaluating a substantial amount of information during patient encounters with various CDSS, complementing professional judgment. More specifically, RNs express trust in the capacity of CDSS to sort and store large quantities of information.

> I have become [positive]. I wasn't before. But I think I actually am. […] So, I think you can get quite far with different types of prediction models and cognitive support that complement your clinical assessment. Our job is too complex to think that you can have in your head to assess all types of different patients that we meet.

The role of RNs in EMS is to identify and treat symptoms but not diagnose. However, the respondents say that they still form a "diagnosis"—a working hypothesis—directing the treatment strategy. Here, RNs' clinical reasoning is supported by trust in the CDSS's capacity to analyze various clinical parameters, which, combined with the RNs' observations, forms a foundation for decision-making. This process may involve ruling out potential diagnoses. As one RN noted: "You may not have diagnosed what it is, but you have at least diagnosed what you don't think it is."

The ambivalence of integrating technical knowledge into clinical reasoning

CDSS both aids and disrupts professional judgment. RNs find interpreting CDSS indicators confusing, and it is not always clear how to consistently signal or interpret different indicators. As one respondent puts it: "The system says there is a high risk of sepsis with a low statistical probability. Ah, but what does that mean?" The interviews and observations show that it is not always obvious what the "right" way to signal or interpret various indicators is. There is also uncertainty about whether all indicators are equally interpreted and understood. Conclusively, professional judgment includes *technical knowledge,* and RNs must increasingly understand the technology behind CDSS, such as how risk grading is structured.

> [I]t was difficult, but that's because I'm not familiar with it. I usually compare this to emptying the dishwasher. At home, you do it in your sleep. Then, you come to the exact same dishwasher in someone else's kitchen. It's impossible because you don't know where something is supposed to be. And it's kind of the same thing when you work in this.

The ability to quickly decode technology, along with general technical knowledge, becomes a key skill in a professional setting that increasingly relies on CDSS. Therefore, understanding and mastering a form of *technical reasoning* is essential for professional judgment. An essential aspect that disrupts decision-making is the complexity of managing systems that do not work properly and/or are synchronized. The clarity and user-friendliness of systems are critical, and a lack of this creates confusion and uncertainty in decision-making situations. Frustration is also expressed when information generated by the systems is ambiguous and when

systems require extensive documentation. In both cases, it is perceived as time-consuming and hindering professional performance.

> Then, I think it was a bit confusing that there was so much that was double. I mean, you have this sort of […] For me to enter whether breathing is affected or unaffected and then enter numbers at the same time; it's unnecessary.

However, CDSS can extend judgment by providing support for second opinions or long-distance consultations, like video link consultations with doctors. Another example is when CDSS serves as a warning or basis for a second assessment, or when used to triangulate the RNs' own assessment.

> [I]t was a huge obstacle that kept jumping all the time, that you never got on with anything. So, unfortunately, it's a bit difficult to evaluate. But as I said, there is a small heads-up, high risk of sepsis. Yes, absolutely.

One's subjectivity in decision-making can also be both supportive and disruptive. RNs note how subjectivity may override professional judgment, causing important parameters to be overlooked. CDSS helps broaden the assessment spectrum by balancing subjectivity with vital parameters and helps to triangulate RNs' assessment with vital parameters.

> The advantage of this kind of support is [that it] complements the subjective assessment because it's so easy to go into performance. We could just as easily have gone into John (simulation patient) with the thought, "Ah, but this is a young guy, it's not so bad." And being a little feverish and a little fast pulse, well he can tolerate it. If you go in with that idea, it's easy to interpret the whole situation. You're kind of looking for confirmatory findings for that thesis. "Ah, but look here, there were no red parameters. It wasn't so bad." But if you then have decision support that complements your own subjective one, you get a broader assessment […]. You have your […] vital parameters; you have decision support; and you sort of try to triangulate your assessment.

From patient focus to system focus

The observations show that RNs focus a lot on the computer tablet at the expense of patient contact. When inquiring into the patient's symptoms and condition and documenting information, the RNs' gaze is fixed on the tablet rather than the patients, and they rarely visually supervise the patient's condition. During the interviews, the participants reflected on the risk of shifting focus from patient to system, that is, technology getting attention rather than the patient.

> I think the danger with all these systems is when the focus is shifted from patient care to a system when you try [...]. I think everyone tries in some way to automate care and make it completely similar; it's impossible. Individuals meet individuals, and

> there's something there. So to completely micromanage it, it's impossible and there are some risks with that.

In the long run, the respondents see risks with CDSS becoming governing instead of supportive. Technology may come to define what should be in focus and possibly affect professional judgment and assessment ability. Thus, technical reasoning may take over the clinical.

> [I]t is easy to lose focus from the patient, instead of just having lots of values and [...] We have so many systems right now, telling us what to do, and are very controlled by that, too.

The patients in prehospital contexts are often in a vulnerable situation, so mutual respect and trust in RNs is central for the collaboration needed in the process of mapping symptoms. In addition to a clinical focus, patients also need attention as human beings, and CDSS can hinder the relational dimension of the patient meeting, affecting the professional self-image of the RN.

> Speaker 1: Sometimes you feel you have to apologize to the patient because all you've done is sit on the phone and try to reconnect cables and stuff to make things work, technically speaking. Or it could be that you don't get an answer to the number you're supposed to call, and you have to call the switchboard, that kind of technical hassle.
>
> Speaker 2: The ambulance nurse, "he just sat and played computer games all the way in."
>
> Speaker 1: Exactly. Ah, but some people don't realize that we write our journal with the screen, you know. They think you sit and surf, you know. And then it's an obstacle. Then, you haven't conveyed a very good picture.

The physical and social interactions between patient and RN are emphasized as central to professional assessment, and the importance of "seeing" the patient in a wider meaning recurs in the interview material. Indeed, the observations show that this interaction is limited because of the RNs' focus on the tablet during simulations.

Professional judgment—A collective process based on tacit knowledge

The RNs express confidence in their professional judgment shaped by experience. This entails relying on embodied knowledge that involves "seeing" patients more holistically, with tacit knowledge guiding intuition or "gut feelings."

> Well, my perception of ambulance staff is that a lot of them have a great deal of confidence in their own clinical ability; that it's almost the other way around, that they, "I don't need aid, I don't need support. I know this; I see this. I feel a heart attack when

> I see it," as it were. […] I think the risk is quite small that you will be disturbed by the technology because you are still so proud and in tune with your own clinical judgment.

Professional judgment for RNs is also about accentuating the importance of safety and interpreting a complex whole. CDSS can indicate individual parameters, but not all, and they cannot coordinate these to the complex whole that a patient constitutes. Hence, a professional challenge is making assessments that sometimes go against what various parameters indicate, meaning that clinical reasoning involves more than summing various indicators individually.

> I have no scruples whatsoever about feeling that a patient may have green vital signs; everything may appear to be as stable as possible, but is there anything that tells me that this patient is going to crash soon? I'm going to call in that patient. I'm not going to have more to say than that.

The RNs find it difficult to pinpoint exactly what constitutes professional judgment, but emotions are involved, and the term "gut feeling" is used to describe its characteristics. This type of tacit knowledge is central to decision-making and can be about something "not feeling good" or "feeling wrong."Professional judgment also involves the courage to trust your feelings and act on them, and requires a focus on the whole patient.

> Everyone who works in healthcare knows how complicated it is to examine a patient. There are so many variables. And in the end, maybe it all comes down to a gut feeling, and that gut feeling is usually right. You can't say what it is, but something here is not right.

Tacit knowledge is based on a network of feelings, sometimes contradictory. RNs may see something, have a suspicion, or not feel something that they should feel, given the situation. Tacit knowledge is strongly associated with years in the profession and experience-generated knowledge.

> [S]o the more clinical experience you have, the more information and knowledge you have to acquire and put in your backpack, and you have to take with you when you go out. Then, it may be that the person who comes out with more experience may catch this sepsis because of their clinical eye, while the person who is completely new does not. I don't know.

Tacit knowledge also involves confidence in colleagues, a trustst built and reinforced over time. Crucial to a well-functioning collegial relationship is the recognition of each other's reactions and behavior patterns. Thus, professional judgment is intertwined both with people (relationships) and professional skills (professionalism). It is described as understanding each other's unique working methods and reaction patterns, meaning that certain communication

becomes superfluous between colleagues. Also, a communication style that is concentrated yet clear—something particularly evident during the observations.

> [A]nd me and [XX] had worked for 20 years together, together. He sees what this is, I know he sees this, I see this, and if I do that, I get the syringe in my hand. You don't talk too much. It's like the optimal cardiac arrest, you don't talk. It's just [Gestures]. It just flows.

RNs' reasoning highlights the importance of tacit knowledge and gut feelings in decision-making. RNs rely on intuitive, experience-based insights to assess complex situations where clinical data may not provide clear answers. Together with confidence in colleagues, these elements are vital for professional judgment.

Clinical reasoning and contradictory routines

Decisions are also influenced by the organization of healthcare, which is subject to the continuous implementation of new procedures and technical systems. The implementation of CDSS in healthcare aims to standardize processes and increase quality and patient safety. However, the impact of technology on professionals tends to promote standardization, which in turn limits the autonomy of professional groups (Petrakaki & Kornelakis, 2016). The downside expressed by the respondents is the vulnerability to technology. Healthcare is expressed as having "painted itself into a corner," and the dependency on technology for decision-making is considered problematic. Resources are also needed for further staff training to strengthen professional judgment.

> I'm a little worried about the whole development in healthcare, where things are very much moving toward standardization. [A]n incredible amount of resources are spent on quality assurance of care using assistive technology, but I think far too few resources are spent on actually training staff and promoting continuing education. Because I find it so difficult to see that the future is that we will have computers that do everything for us [...]. Everyone who works in healthcare knows how complicated it is to examine a patient. There are so many variables. And in the end, maybe it all comes down to a gut feeling, and that gut feeling is usually right. You can't say what it is, but something here is not right.

What also becomes clear are conflicts between various CDSSs and how these are embedded in the organization, creating different routines between hospitals, and negatively affecting clinical reasoning. Many and various routines also increase complexity, and when assessing, paramedics sort through a wide range of impressions and information that goes beyond CDSS and are based on professional experience and a sense of wholeness. Technical reasoning sometimes overshadows the clinical, and the RNs find it difficult to argue against a procedure or routine.

> But from the emergency department, there are very clear requests that you can only call this phone if it is a patient who has an ongoing ST-elevation myocardial infarction. And then, they send deviations to our organization, which passes them on, and sends it out as a request to, ah, only call on patients who have ST infarctions. At the same time, we still have our own routines. And that's how it is with so many routines right now; that it's just a roundabout way of doing things.

The standardization through CDSS conflicts with RNs' need for individualized patient care, thereby limiting or structuring their discretion. This becomes evident when RNs come to a different conclusion than the CDSS indicates, and the complexity of decision-making becomes vivid when difficulties integrating technical and clinical reasoning occur.

> This is a patient who needs to seek care, but our assessment on-site is that we may not need to take this patient to the emergency room. We are left with that feeling, while we have a system that says we have to take this patient to the emergency room [...]. But there is the system [...]. Or the organization has chosen to use the system in a way that, no, we can't do that, and if you do it, you do it on your own. And I don't like that development. Because then, you completely take away our clinical view. You take away [...]. Although we have long, long routines for how an abdomen should be examined, we do the entire examination, and in the end, it's the little line of text that decides. And I don't agree with that. I don't understand the patient benefit of it.

While the technical aspects of healthcare, such as the use of technology, are important, they are often embedded within a bureaucratic framework. The challenge for RNs lies in the need to integrate both technical knowledge and clinical reasoning into their professional practice, which adds complexity to their work. While technology can impact care, the most significant issue is the overload of systems, tools, and routines that RNs must navigate. Rather than supporting decision-making, this often creates barriers and obstructs timely and informed decisions (cf. Timmermans & Epstein, 2010).

There is skepticism among the respondents as to whether CDSS can "reason" as RNs can. Technology requires learning and a collective acceptance to fully integrate into work processes. That is, collectively shared professional dispositions—essentially a CoP—that govern what is considered valuable knowledge, what earns recognition, and which processes are deemed legitimate within the profession. Here, a conflict can arise between CDSS and professional judgment. This becomes particularly obvious when RNs need to compromise their professional values based on what the systems indicate.

Discussion

Clinical reasoning, as shown in our results, is challenging due to conflicting technical systems, guidelines, and routines. Although CDSS ideally offers flawless assessment, RNs must adapt these assessments to an imperfect context. Our findings demonstrate that the integration of

CDSS into clinical reasoning hinges on professional *discretion, trust,* and embeddedness in a *CoP*.

Discretion and trust

Various systems and routines can sometimes override professional decision-making. Instead of supporting clinical reasoning, this type of standardization creates frustration and confusion among RNs (cf. Khalifa & Zabani, 2016). Yet, RNs' discretion remains critical in situations that require a professional "gaze" and the ability to make decisions based on their judgment, regardless of systems or routines. The issue of tacit knowledge has gained significant attention in professional research, and our study highlights its importance in trusting one's judgment, professional experience, and knowledge generated from practice (cf. Trowler & Knight, 2000). Moreover, trust is crucial in ensuring that technology does not overshadow professional judgment, allowing RNs the discretion to make decisions based on their experience, knowledge, and understanding of a broader context.

Emotions are also central aspects of how CDSS relates to professional discretion and trust. Emotions are components of RNs' tacit knowledge, based on a network of feelings, sometimes conflicting ones. RNs may have a suspicion or a feeling that guides clinical reasoning. This can be seen in light of professional dispositions regarding what is seen as valuable knowledge, and which processes receive recognition and legitimacy (cf. Wacquant, 2005). Professional decisions arise from actors' practical reasoning and have a reflexive side; hence, actors do not act solely on their dispositions. Andrew Sayer (2010) points out that we constantly evaluate what we attribute meaning to in terms of ethical dimensions. Professional or clinical reasoning, in other words, involves ethical positions based on emotions. Therefore, the impact of emotions on judgment and how to trust CDSS is crucial in understanding the embedding of technology in clinical reasoning.

Trust becomes the link between one's own and other professionals' skills and is built up over time by working together. Trust also relates to organizational jurisdictions, because trust in the professional judgment of RNs is related to the knowledge and trust that colleagues in other organizational departments have in them. This illustrates a negotiation strategy and that the effects of decision-making are influenced by how we trust each other's professional judgment ability when cooperating.

Community of practice

Decision-making is in focal parts a collective process, relying on subtle and deeply ingrained mechanisms of mutual understanding among colleagues. Over time, team members develop an ability to "see" and "recognize" each other's work patterns and intentions without the need for explicit communication. Key interactions often take place through quick glances, affirming nods, or brief, highly efficient exchanges, where lengthy verbal explanations are un-

necessary. This seamless coordination is a manifestation of shared tacit knowledge, characteristic of a CoP, where members share a common understanding built through sustained collaboration and experience.

A CoP does not operate independently; rather the ability for discretion and judgment is dependent on the organizational preconditions that involve technical reasoning. Evetts (2011) highlights that a new professionalism is emerging in which there is decreasing professional autonomy and increasing control bodies. These are apparent in our study regarding how RNs are expected to accept, incorporate, and conduct their work based on organizational ideals of decision-making. However, new strategies and practices develop as professions adapt to new challenges and opportunities (cf. Bergquist & Rolandsson, 2022; Noordegraaf, 2020). The conditions for RNs to establish their work on the cognitive base of their profession are highly reflexive and responsive in relation to the organizational context and work tasks.

A common conception is that humans will always make mistakes no matter what; it is simply in our nature (Patterson & Hoffman, 2012). Deficiencies in human decision-making have also led to perceptions that we have not yet managed to create systems that humans can fully understand. Conversely, reducing the influence of human judgment in favor of technical reasoning is problematic, as it limits our understanding of how human decision-making functions in various situations (cf. Bovens et al., 2002). However, as Patterson and Hoffman (2012) highlight, decision-making involves more than just avoiding mistakes; it also requires achieving "sense-making" of the information available in each situation. This process enables individuals to make decisions that, while not always perfect or optimal, are "good enough" to address immediate problems (cf. Klein, 1998).

Conclusion

The study highlights the complexity of integrating CDSS into clinical reasoning for RNs. While CDSS aims to enhance decision-making, it can conflict with the professional judgment of RNs, who rely on discretion, experience, and tacit knowledge. The tension between standardized technical systems and the nuanced, context-based reasoning of RNs creates frustration and challenges in maintaining autonomy. Trust, both in one's own judgment and in colleagues, plays a pivotal role in navigating these complexities, emphasizing the need for collaboration and mutual understanding within a CoP. Moreover, the study underscores the ethical dimensions of clinical reasoning, showing that emotions and professional experience significantly influence decision-making processes. Balancing technical reasoning with human judgment remains crucial for maintaining the integrity of clinical reasoning.

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