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Evolving nursing decision-making – from theories to smart care decisions

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1 Introduction

Nurse's and nursing decision-making are an essential part of high-quality care. Good decisions can increase patient safety, avoid mistakes and make care more consistent. Nursing decision-making combines researched knowledge, clinical expertise and the patient's views on their own care. Through research, we have been able to increase the visibility of nurses' work and articulate their role in multidisciplinary patient care. We need this understanding when developing nursing expertise, education and training. Meaningful and effective decision-making increases patient safety, especially in situations that require quick decisions. Good decision-making can reduce nurses' stress and support ethically sound solutions. Nursing decision-making affects the entire patient care process and has an impact on the length of care, costs and resources.

In this commentary, nursing decision-making is understood as a systematic, knowledge-based thinking and action process in which the nurse collects and evaluates patient information, interprets the situation using clinical reasoning, weighs alternative courses of action, makes a professionally and ethically justified choice, implements the chosen course of action, and evaluates the effects of their decision on the patient's care and safety. Clinical assessment, clinical reasoning, and clinical judgement are related to the nursing decision-making process. Clinical assessment can be seen as part of the decision-making process. Clinical

reasoning can be understood as the cognitive thinking process that the nurse uses when making decisions. Clinical judgement can be seen as the solution that ends the reasoning process. These concepts are sometimes used as synonyms for nursing decision-making. However, in this article, nursing decision-making is seen as the whole process including the actual decision.

Nurses' decision-making is enabled by their cognitive mechanisms, i.e. their observations, interpretations, reactions and reflections. Decision-making is guided by the nurse's education, professional ethics, knowledge and ability to acquire new information, as well as their professional autonomy. Externally, they are guided by legislation, organisational norms, operating culture, available resources, and the patient's wishes and values. This makes decision-making a complex process and has opened the door to interesting research. Research and development in decision-making have been of interest to nursing researchers ever since the days of Florence Nightingale (Nightingale 1859).

Research into nursing decision-making has developed in stages over the last fifty years, much like research into many other nursing phenomena. In the early stages, the focus was on defining and delimiting the concept: what is meant by nursing decision-making and how does it differ from related concepts. Based on this conceptual work, theoretical models have been developed to structure the phenomenon and deepen understanding of the nature of decision-making in nursing. During the years 1990-2010, the focus of research shifted to the operationalisation of the concept, that is the conversion of decision-making into a measurable and empirically observable form. This enabled the systematic testing of theories and the identification of key factors related to decision-making in nursing. This paved the way for clinical research, which has made it possible to examine the implementation of theoretical models in everyday nursing practice. Clinical research, in turn, has laid the foundation for the development of interventions aimed at supporting, strengthening and developing nursing decision-making in practical nursing, management and leadership.

2 Evolving research and practice of nursing decision-making in the past 50 years

2.1 Nursing decision-making theories and models

Key decision-making theories in nursing science include intuitive decision-making models, rational decision-making theories and models, models combining these two theories, and decision-making models based on cognitive continuum and knowledge construction. In intuitive decision-making and models based on it, the idea is that decision-making takes place partly unconsciously and based on strong experience. The idea behind intuitive decision-making is that nurses use this type of decision-making especially in situations where the time available for decision-making is short, the decision-maker is experienced, and the decision must be made with incomplete information.

In rational decision-making theories, decision-making is seen as a logical, step-by-step process in which information is systematically collected and used to identify the problem. After this, the available options are weighed and evaluated, and the best possible solution is selected. According to this model, decision-making proceeds logically and the solution is justified by objective information. In nursing, rational decision-making models are used in clinical care process models and, for example, in decision-making on care recommendations. In such cases, decision-making is based as far as possible on researched information and is transparent and justifiable.

In the early 2000s, theories were put forward that combined the two previous theories of intuitive and rational decision-making, stating that decision-making is situation-specific and that, for example, the

nurse's knowledge and experience, the time available, surrounding circumstances and the nature of the patient's problem affect how the decision-making process proceeds. Clinical situations always involve uncertainties, and we do not have access to all the information we might need, so decision-makers have to combine intuition and rational thinking when making decisions.

Decision-making models based on cognitive continuum theory assume that human decision-making and the availability and manageability of information are always limited. They also recognise that solving human problems, such as health problems, always involves uncertainty. Decision-making situations are always different and not entirely clear-cut. When solving human health problems, the nature of the problem and the treatment environment are linked to the thought process used. Based on this kind of theoretical thinking, decision-making processes can be viewed as processes of individual patients. In this case, the patient is a multidimensional system, and individual decisions related to them affect the whole individual. For example, when treating a patient's pain, the individual's biological, psychological, social, cultural and spiritual characteristics as well as their life situation must be taken into account. System theories have also examined nursing decision-making from the perspectives of organisation and society. Nursing decision-making does not take place in a vacuum, but within a health care system and society that set the framework for decision-making.

2.2 Developing perspectives on nursing decision-making

As nursing decision-making research has developed, various aspects related to decision-making have increasingly come to the fore, such as interprofessional decision-making, shared decision-making and their combination, interprofessional shared decision-making, or the aforementioned systems theory approach. The subjects of research have shifted from the decision-making processes of individual nurses to, for example, the division of labour, organisational culture, the importance of patient safety in decision-making, leadership, shared decision-making, the patient's role in decision-making and the development of service systems, as well as ethical decision-making.

Nurse autonomy describes a nurse's ability and right to make independent decisions. Professional autonomy is part of clinical expertise. Professional autonomy enables nurses to make evidence-based independent decisions, for example, regarding pain assessment or choosing nursing interventions that take into account the individual characteristics of the patient. The level of autonomy varies from country to country. This is related to education and the way work is organised. International research on autonomous decision-making in nursing enables a comparison of the division of responsibilities and opens up a discussion on the transfer of tasks between professional groups. Professional autonomy and expert decision-making highlight the expertise of nurses and strengthen their independent position within the organisation. This has been found to be linked to professional pride and job satisfaction, among other things. Independent decision-making speeds up operations, but at the same time increases responsibility.

Prioritisation as part of decision-making has only recently become a subject of scrutiny. Prioritisation can be understood as a decision-making approach in situations where a patient has multiple needs and the nurse has to consider which needs are most urgent, which issues can wait, and whether the patient has any needs that cannot be addressed at this time. On the other hand, prioritisation is linked to healthcare resources, in which case it is based on the urgency of tasks, patient safety and the use of organisational or societal resources. According to the principles of systemic thinking, decision-making involves patient safety, which is a key value and principle guiding decision-making in nursing. It is important, for example, in the choice of nursing interventions such as pain relief methods. Ethical reasoning is a reflection on the values of nursing, patient autonomy, self-determination and justice.

2.3 Approaches to nursing decision-making research

Research into decision-making is challenging because, at least for the time being, we cannot access the phenomenon that occurs within the individual – how a person makes a decision and what kind of cognitive processes are involved in decision-making. In addition to theoretical models and theories of nursing, attempts have been made to study decision-making in nursing using, for example, thinking aloud, simulated and controlled scenarios, observing reality, and retrospective and prospective interviews and subsequent reflection on the processes.

We can approach the thought processes of nurses, for example, by asking them to think aloud during decision-making. This allows us to hear nurses describe what they notice, how they interpret events or situations, and how they prioritise tasks and activities, for example. Thinking aloud has been used particularly in psychology, where it was developed, but also increasingly in nursing science. Thinking aloud can be used in a real environment. It can also be combined with observation, which broadens our understanding of what is happening in a situation.

Various vignettes and simulations have become very common. They can be used both to practise decision-making and to study it. In vignettes, cases are described in writing or on video, while simulations are acted out, either using dummies or actors. In both methods, the subjects or students are given carefully designed patient situations, the events of which can be documented in various ways. In these cases, we observe how the subjects recognise the clues given to them, what solution options they consider, how they act in different situations, e.g. under pressure, and what choices they make. If the study is repeated, changes in the individual's decision-making, such as learning, can also be observed. Simulations have become an important way of practising decision-making, especially in situations that require quick decisions. They are used in both education and hospital settings.

Other methods used in decision-making research include interviews and surveys. Both of these can be used to examine, for example, the reasons behind actions. Interviews can be used to find out what the interviewee thought in a situation and why they acted the way they did. The interviewee can reflect on their actions, allowing the researcher to assess their reasoning skills, logical thinking and situational awareness. Surveys can also be used to assess the interviewee's own views on their skills or ways of working. One uncertainty associated with surveys is the subjectivity of the respondent. Nevertheless, it is an important way to gather the respondent's own views.

More recent decision-making research has examined, for example, the measurement of cognitive load and physiological reactions (e.g. where a nurse distributing painkillers focuses their gaze in the medicine cabinet, known as 'eye tracking'), or how quickly a nurse reacts to the clues they receive. We can also monitor heart rate or brain activity using electroencephalography (EEG) in simulated decision-making situations. In such studies, subjects can be given a standardised case to solve and, for example, the neurocognitive activity of a novice and an expert can be compared. This has been tested in demanding simulated situations such as resuscitation. The brains of experienced decision-makers show different electrical activations than those of inexperienced decision-makers. (Toy et al 2023)

Another relatively new approach to decision-making is the use of artificial intelligence (AI) to analyse entries made by nurses in electronic health records. These studies can use natural language processing methods and big data analyses in nursing decision-making research. We can retrospectively examine, for example, decision-making processes related to pain management or make automatic classifications and predictions based on text. Our research group's studies are currently focusing on this theme. Research into nurses' actual entries has brought with it a fascinating opportunity to see the decision-making paths of individual nurses involved in the care of a single patient. How does each nurse influence the patient's care with their decisions? In shift work at a hospital, nursing decision-making is not a single event for one nurse, but rather consists of a series of interconnected decisions made by different people in the care process,

based on previous observations and solutions, which in turn influence the decision-making of subsequent nurses. Decision-making processes are dynamic. This adds an interesting dimension to decision-making research, as the decisions made by individual nurses depend on information transfer, documentation and reporting. Tacit knowledge and intuitive decision-making, which may not be documented in any way, add another dimension to this.

3 Future Directions of nursing decision making

3.1 Technology supporting or substituting nurses in decision-making

We cannot ignore technology in nursing decision-making in the future. It is already apparent that research is increasingly focusing on the use of technology to support decision-making. Nursing documentation, which makes nursing decision-making visible, plays a significant role in this. Proofreading programmes and structured data collection are already available to support documentation. In addition, various triage forms have been developed to help nurses assess a patient's status or risk of unwanted events. Nurses are already supported by various mobile devices that allow them to monitor the patient's condition, make observations and record them at the bedside. Nurses continue to make decisions about interventions based on technologically supported assessments. The use of technology in recording requires digital literacy competency. This has been increasingly added to the education and training of nurses. In the future, we may also see patients themselves using technology to monitor their own condition even in hospital settings. Patients will be able to record patient-reported outcomes and experiences directly in their medical records. The patient's role as an active participant in their own care will be strengthened.

We are also currently seeing a trend where artificial intelligence and machine learning are being used to combine an individual's genomic data, lifestyle data and social data in order to select more personalised nursing care options. It may be possible to help individuals even better based on their individual needs and lifestyles. Nurses will no longer make decisions based solely on symptom detection, but will be able to use the patient's individual data much more extensively in their decisions. The role of nurses will change from reacting to problems to proactively promoting health. In the future, nurses will rely more heavily on artificial intelligence to support their decision-making. For example, Finland has a national data archive (KANTA-archive) for individuals, which collects information on their use of health, rehabilitation and social services throughout their lifetime. In addition, the archive will in the future include a section where individuals can accumulate their own health data, for example from various mobile applications. This will change not only decision-making in nursing, but also the structures of the entire health service system. (https://www.kanta.fi/en)

Another visible trend brought about by technology is the increase in robotics. In addition to artificial intelligence, robotics is taking over tasks such as dispensing medication and monitoring patients' overall condition from nurses. The role of the nurse as a decision-maker will be complemented by the supervision of AI-controlled processes. When caring for an individual, the nurse will compare the information produced by AI with the patient's condition and wishes. It is expected that in the future, nurses will only intervene in processes and make decisions in special cases. Decision-making power will become increasingly technology-based. In addition, technology will enable the collection and comparison of data internationally. Artificial intelligence may become one of the decision-makers among nurses. Various possibilities for combining databases containing patient information on a Europe-wide scale are already being considered, and the use of so-called federated learning methods are being explored and tested in nursing decision-making research. The federated learning method means that the collected big data does not need to be transferred from one country to another, but large amounts of data can be analysed using deep learning models in their home country and the data is only combined after the analysis. This ensures that the data remains anonymous, which is essential when researching patient data.

Artificial intelligence and the rapid development of its methods are bringing entirely new dimensions to the research and development of nursing decision-making. At the same time, it also brings problems that need to be solved, such as legal and ethical issues. The use of artificial intelligence is gradually enabling the transfer of clinical decision-making by nurses to technology, even to a large extent. The role of nurses is changing from caring for individual patients to developing nursing guidelines and plans. The nurse's task is then to monitor the ethics of nursing, cultural diversity and the fulfilment of the patient's interests and wishes. This requires nurses to have not only good clinical skills but also a stronger understanding of ethics and humanity, as well as strong digital health literacy skills.

Perhaps in 50 years' time we will be able to use quantum computing to support nursing decision-making research and practice. Quantum computing is still in its infancy, but it is thought that in the future we will be able to process huge numbers of different options in parallel. In quantum computing, so-called qubits can work synergistically, using each other and transmitting information much faster than is currently possible. Quantum algorithms can perform certain tasks, such as optimisation and various simulations, faster than current computers. Quantum computing can solve problems that cannot be solved today. Quantum computing might open a pathway to evaluate at the same time what value a chosen care pathway brings to the patient, to the institution offering the care and to the society as a whole. (see e.g. Jeyaraman et al. 2024.) We can then make informed choices and decisions that have the greatest benefit for all.

3.2 Challenges to tackle in the 50 years to come

The adoption of technology in decision-making also presents a number of challenges that healthcare and nurse scientists need to investigate. Various ethical challenges posed by the increased use of artificial intelligence in healthcare and nursing decision-making have already been raised as a major concern. Artificial intelligence uses previously produced data available for data collection and uses it to make summaries, predictions, classifications and decision proposals. If we use information that does not represent the target group broadly but is skewed in some way as a basis for decision-making support, then the decisions or proposals made by artificial intelligence will be based on incorrect information. For example, if artificial intelligence makes a proposal for a nursing summary that lacks information essential to nursing, but the nurse as the decision-maker does not notice this, there is a risk that the nurse will choose completely wrong methods of care.

It is already apparent that many AI-based solutions are so-called trade secrets, and the companies that have developed them do not openly share information about how a particular solution was arrived at or what information the AI programme uses to suggest actions. This is a serious concern when considering the reliability of the decisions made. In our own research, in which we aimed to develope an objective measure for assessing pain in non-communicative intensive care patients, we found that nurses were unwilling to trust the AI's assessment of patient pain because they did not know exactly what the technology's view was based on. It may be equally problematic if a nurse relies too heavily on information generated by artificial intelligence and makes decisions based on artificial intelligence suggestions, even though the patient's symptoms and appearance give conflicting signals. The challenges of increasing the use of artificial intelligence arise from that we do not ultimately know where artificial intelligence is already being used and how it affects the decisions we make without our noticing.

There are risks associated with the internationalisation of the information on which decision-making is based. We need to consider how we can take cultural factors into account in information processing. Understanding the cultures of small populations poses particular challenges. For example, when we build international patient pathways for patients’ pain care, can we take into account the wide variations in the significance of different cultural and social factors in decisions related to pain care?

The use of technology in healthcare and nursing decision-making brings with it a challenge in terms of energy consumption and the resulting emissions. Big data models can consume a surprising amount of energy. Healthcare generates a huge amount of data, even for individual patients. The manufacture of supercomputers, the training and use of various algorithms, the energy and water consumption of data centres, and the disposal of obsolete equipment all place a burden on the environment. Alongside development work, it is necessary to consider energy efficiency, renewable energy sources, and the responsible use of artificial intelligence in healthcare.

3.3 Nurses should be prepared for the future

Nurses currently do not have sufficient opportunities to influence the development of healthcare technology to support their decision-making. In many countries, there are shortcomings in education and training. Nurses need good digital literacy competency so that they can participate in technology development and bring a nursing perspective to it. In Europe, care should be taken to ensure that all countries have national digital nursing strategies that strengthen the role of nurses as influencers. However, with the opportunities offered by technology-assisted decision-making support systems, we must not forget the humanistic ethos of nursing or the ethics of nursing; these must be integrated into good digital literacy skills.

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