HealthManagement.org
The Journal
LEADERSHIP • CROSS-COLLABORATION • WINNING PRACTICES
VOLUME 19 • ISSUE 4 • 2019 • € 22
ISSN = 1377-7629

Monitor Me!

Nurses and Cutting Edge Technology

Summary: Modern nursing is a multi-layered field of work with increasing work density and complexity, which requires a high level of competence, resilience and commitment from the nursing staff.

Iris Meyenburg-Altwarg
Managing Director of Nursing Medical University (MHH) Director of the Academy for Nursing Education & Training (MHH) Hannover, Germany
President of European Nurse Directors Association (ENDA)

Meyenburg-Altwarg.Iris@MH-Hannover.de

In numerous professional situations, nursing professionals are required to have a high degree of spontaneous problem solving, abstraction skills and a safe application of highly technical specialist knowledge.

In Addition to psychosocial stresses, there are also physical overloads. Although technology in the field of medicine is accepted, there can still be resistance from the nursing sector to acknowledge and apply some of these technological advances.

On the other hand, the need for personal and social contacts of "Care Receivers," in particular, due to demographic change and as the associated shortage of specialists, continues to grow, it will be more essential for the healing process of patients than it is today. It is, therefore, apparent that the possible use of new technologies can create valuable opportunities for professional care and care receivers.

Impact Cascade

Experience in the field of technology and nursing has shown that innovative technologies in nursing are often conceived without the primary involvement of nursing staff and miss the concrete need and thus either do not represent real support for nursing staff in practice or are not known to them or are not applied (Care and Technology 2015).

It follows from this that possible potentials cannot be exploited or not sufficiently exploited by technologies and that the urgently needed additional needs for care cannot be met. Depending on the country-specific health care system, the gap between service demand and service provision will widen in favour of a two-or multi-class system, particularly in the outpatient and homecare sectors.

> "ALTHOUGH TECHNOLOGY IN THE FIELD OF MEDICINE IS ACCEPTED, THERE CAN STILL BE RESISTANCE FROM THE NURSING SECTOR"

The following description does not deal with the occasional use of technical equipment to support the need for care, but with the strategic realignment of attention in the interaction of man-machine.

Traditional Solutions

The use of nursing innovations in the inpatient sector often takes place top-down without sufficient integration of the experience and demand potential of the nursing staff. In the outpatient sector, the use depends on whether, how, or which innovations are supported and financed by insurance. So there are often so-called catalogues of equipment, which promise the patients/clients a better or simple life. The associated ethical, legal and social challenges are of limited application. The subsequent user acceptance is limited.

IT2Nurse

To support nursing professionals in inpatient and outpatient care, innovations in human-technology interaction can be used to improve the performance, quality and quality of life of patients/clients (Imagining nursing practice 2050 2007).

What is that?

By IT2Nurse the author understands the use of technical innovations in three main categories:

Category 1: Assistance of qualified personnel through innovative technologies

In particular, transport and service robots (eg MiR100), lifting aids, intelligent sensors for beds and emotional robots (eg Pepper), point of care through automated data transmission, etc. is used.

Category 2: Replacement of skilled personnel by innovative technologies

As a replacement for qualified personnel, primary systems can be considered, for example, the reduction of transmission of germs through fully automatic systems (closed-loop in medication management) and UV light Robotic.

Category 3: Process support/empowerment of patients/clients/personnel through innovative technologies

From exit and fall prevention to sensor-controlled orientation lighting, standing aids and balance promotion (My colleague the robot 2016).

Cornerstones of Successful Use of Technology

There are three essential prerequisites for the successful use of technology. These include the *circulation of knowledge*, the acceptance of technology and, following this, proof of practical suitability and effectiveness *after adaptation of the operative work processes*.

1. From knowledge transfer to knowledge circulation

The original term "knowledge transfer" refers to a one-sided movement of current knowledge into practice. According to implementation science, this process does not succeed because on the one hand, no problem analysis is carried out, and on the other hand, practical knowledge is not included. The term "knowledge circulation" on the other hand, makes clear the need for equal interaction between stakeholders. With regard to the introduction of innovations, the application of the knowledge circulation of "Knowledge Triangle" (practice, research and education) (from Knowledge Circulation to the Triple Helix 2015) enables an equal exchange of knowledge from different perspectives and thus a continuous need-based further development of technologies in a useful application orientation and possible acceptance.

Quo Vadis

Innovative care technologies are urgently needed - but take time. The selection of products on the market today is already almost unmanageable. The promises of the manufacturers surpass each other in terms of potential savings and improvements. Nevertheless, realistically speaking it will still take a relatively long time until a product from a pilot phase enters everyday life. The technology is often quickly installed, but complete integration usually takes much longer. Each institution must, therefore, consider very carefully whether and for which application it decides and how it uses it. The so-called digitisation check has proven to be helpful in the run-up to the event. These are offered by various research institutes (Digitisation check eg Fraunhofer Institute for Software and Systems Engineering ISST) or private providers, among others, and usually include models of SWOT analysis, the business model Canvas and or design thinking. Digitisation checks also help to prepare the changeover processes and to set the new procedures in motion.

To ensure that the various nursing innovations in Germany can be better tested for their practical suitability and acceptance, the Federal Ministry of Education and Research has launched a comprehensive funding initiative entitled "The Future of Nursing." Nursing experts in four so-called Nursing Practice Centres (PPZ-Pfegepraxiszentrum) in Hannover, Freiburg, Nuremberg and Berlin are testing innovative nursing technologies for practical suitability, acceptance and benefits in real

Challenges

- Lack of patient human touch may lead to emotional problems for the patient
- Distance in Nurse-Patient Relationship
- Missing of other observations in patient's body/health due to shortage of stay in the hospital
- Shortage of patient stay may cause financial problems that may affect the overall function of the hospital
- Failure in cross verification of remote monitoring system function
- Human negligence due to nurses psychological distress and burnouts by continuous monitoring
- Inaccuracy/errors in remote monitoring parameters that may sometime increase the mortality rate
- No immediate plan in case of remote monitoring system failures
- Complexity in reset nurses routine when needed
- Full dependency of remote monitoring results

Possible Remedies

- Maintain limited and mandatory nurse's visits to patients and ensure that every patient is personally met at least 2 times during their duty period
- Plan for special rounds to identify their psychological needs
- Documentation of other observations in patients' health during the visit for better nursing care
- Compare critical paraments – Nurses observation Vs Device results
- Develop and maintain an emergency plan during improper functioning of the device
- Periodical checking and maintenance plan for the remote monitoring system
- Record regular feedback at consistent intervals and study for improvements
- Provide the technical assistance round o`clock in case of device failure
- Provide the alternative facilities (manual devices /assessment methods) for observation and treatment in case of device failure. The protocol can be useful to handle this situation
- Revising the hospital budget may be helpful to maintain/improve the financial status

Figure 1: Selection of Challenges and Possible Remedies by Introducing Patches (own representation)

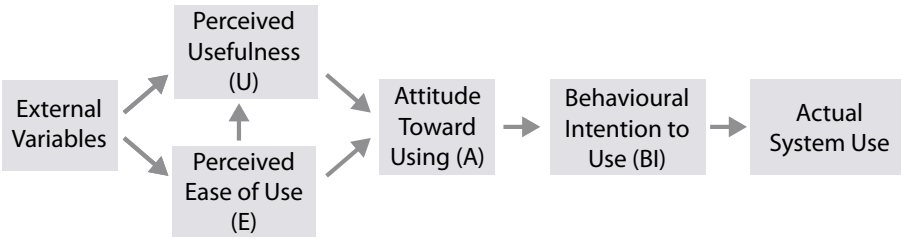

Figure 2. Technological Acceptance Model Based on Ajzen/Fishbein

Planning	• Which technologies/scenarios are suitable and where should they be applied? • Which technology is pursued with which goal? • What are the effects of the technology introduction on the company and the employees/recipients?
Implementation	• What steps need to be taken to implement it? • How can employees and stakeholders be involved at an early stage? • Will training offers of technical competence in further education and training?
Stabilisation	• How can success be implemented in the long term? • Which structural and procedural adjustments have to be made?
Evaluation	• How successful was the change process? • What can be gained from the implementation process for future technology introductions are learned?

Figure 3. Key Points for Technology Implementation (Own Illustration)

operation (2018-2023). The aim of the "Nursing Practice Centre (PPZ-Pflegepraxiszetrum) Hannover" project (ppz-hannover.de 2019) is to set up a sustainable ward in which technical innovations are used to support nurses and improve patient care. The redesign will take place at an accident surgery ward of the Hannover Medical School (MHH).

Within the framework of implementation, the selection and introduction of technological innovation takes place in a participatory manner, ie together with the nursing staff. The practical suitability and effectiveness are jointly tested before innovations are widely applied. Through this participatory approach, innovations in Human-Technology Interaction (MTI) in Nursing should benefit from the expertise and experience of the nursing staff.

Critical Thinking

In addition to the generally accepted approach in project and change management, particular attention must focus on the critical discussion of what influence the new technology implementation may have on the care philosophy and working culture experienced in the institution and how these should and must be applied.

Example: Single use "Patch Application" of non-invasive method to measure the vital parameters of cardiothoracic surgery patients.

There are different surveillance methods available for the post-operative patients in the hospital to measure the vital parameters. Wireless systems are widely used for ECG monitoring, SPO2 measurement and blood pressure monitoring. The usage of the non-invasive method will be helpful in preventing infection; complications induced by invasive procedure and improve patient comfort and safety. This patch is a single-use monitoring device, which can work continuously up to 10 days. The data is recorded in the device and transmitted through Wi-Fi/Cellular/Ethernet to an APP Portal. As a nursing point of view, it will reduce the workload, can increase job satisfaction, help in time management, cost reduction and balance the shortage of the nurses.

Challenges and Possible Remedies from the Nursing Perspectives

The following points are only a small selection and serve as a suggestion as to which side effects can occur through the implementation of patches and what considerations there might be to counter these.

2. Technology Acceptance

In the context of ergonomics, so-called technology acceptance (TAM) is defined as "the positive acceptance or adoption of an idea, a fact or a product, and in the sense of active willingness and not only in the sense of reactive tolerance." Ajzen/Fishbein describes two crucial variables: "Perceived Usefulness" and "Perceived Ease of Use." This can result in the behavioural intention and actual system use.

In addition to the acceptance of potential users, all relevant ELSI (Ethical, Legal and Social Implications) aspects must also be clarified satisfactorily.

3. Process Adaptation

Technological innovations and assistance systems actively interfere with familiar workflows and organisational structures. A practical added value in human-technology interaction can only succeed if the employees (users) think along with the work process and are familiar with the technical environment, accept it and use it.

Process adaptations can be made in a variety of ways. Each approach has its own advantages and disadvantages. The best known methods are: participating observation, self-observation, document analysis workshop, interview or electronic workflow presentation.

Summary

To increase potential through the use of technological innovations, it is necessary to create basic strategic prerequisites in the long term and to deal with the topic in greater depth. Technical interventions to support the nursing profession and a measurable improvement in the quality of the services offered for Care Receivers have not yet been sufficiently and effectively used. The suggestions and impulses listed above are intended to encourage people to counter them. ■

KEY POINTS

- Many in the nursing sector are resistant to understanding and using new technology
- As the shortage of health specialists grows, technology can create valuable opportunities within the nursing sector
- New technologies are often developed without any consultation with the nursing sector
- New technology often doesn't address the core needs
- The gap between service demand and service provision will widen particularly in the outpatient and homecare sectors
- Introducing new technology in the inpatient sector often takes place top-down without sufficient training for the nursing staff
- In the outpatient sector, the use of technology usually depends on if it's supported and financed by insurance
- A lot of equipment, which promises better care, cannot be used through lack of training
- Before developing new technology, it is essential to work with the nursing sector to address their requirements jointly
- When introducing technology, the focus must be on the benefits and how they will be applied.
- The most effective training is through workshops, interviews or electronic workflow presentation

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