



## New technology improve nursing practices and patient's outcomes

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### Abstract

Implementation of technology in health care has become a global trend. It increases nurse's efficiency, but it is also changing the way of care for patients. Technology in nursing has moved them away from pen and paper; from manual ways in delivering nursing care, to being knowledge workers. Technology being central to delivery patient-centered care for improving patient status and outcomes. While patient care technology offers many opportunities to improve nurse productivity and satisfaction, operational efficiency, patient satisfaction, safety, and outcomes, furthermore use of technology in nursing practice preventing errors and adverse events so improved patient's outcomes. Before extensive application of technology, nurses relied heavily on their senses of sight, touch, smell, and hearing to monitor patient status and to detect changes. Over time, the nurses' unaided senses were replaced with technology designed to detect physical changes in patient conditions. Consider the case of pulse oxymetry. Before its widespread use, nurses relied on subtle changes in mental status and skin color to detect early changes in oxygen saturation, and they used arterial blood gasses to confirm their suspicions. Now pulse oxymetry allows nurses to identify level of oxygenation saturation before clinical symptoms appear, and thus more promptly diagnose and treat underlying causes. Technology advancements have changed the nursing practice, as the following: Enhanced Communication as use of smartphone; Use of technology innovation as: Electronic Records and barcode; GPS tracking using indoor hospital and Tracking an Ambulance with Global Positioning System; Enhanced Diagnostic Devices as ultrasound technology. When needing help placing an IV, an ultrasound machine can pinpoint the exact location to minimize patient distress; Drug Delivery include lipidic, proteic and polymeric technologies; Smarter Alarm Systems as monitor vital signs and Lifting Patients with Ease as electrical or hydraulic power.

**Keywords:** technology, nursing, patient's outcomes

### 1. Introduction

Technology in the nursing practice within the world has increased patient satisfaction and overall outcomes, reduced clinical errors and decreased the amount of paperwork that nurses were once required to perform their patient care. Nurse's capability to understand and direct the balance of patient care with the technology systems and organizational structure that supports this balance toward patient's outcomes <sup>[1]</sup>.

Nursing, is an fundamental part of the health care system, encompasses the promotion of health, prevention of illness, and care of physically ill, mentally ill, and disabled people of all ages, and in all health care and their goal is positive patient outcomes, so they use technology to improve patient care. The World Health Organization Medical Devices and Equipment team described a life-cycle approach that systematically includes maintenance, training, monitoring, and vigilance reporting on medical devices in use <sup>[2]</sup>.

While technology holds much promise, the benefits of a specific technology may not be realized due to four common pitfalls: (1) poor technology design that does not adhere to human factors and ergonomic principles, (2) poor technology interface with the patient or environment, (3) inadequate plan for implementing a new technology into practice, and (4) inadequate maintenance plan <sup>[3]</sup>.

Patient care technology has become increasingly complex; transforming the way nursing care is conceptualized and delivered. Before extensive application of technology, nurses relied heavily on their senses of sight, touch, smell, and hearing to monitor patient status and to detect changes

<sup>[4]</sup>. Consider the case of pulse oximetry. Before its widespread use, nurses relied on subtle changes in mental status and skin color to detect early changes in oxygen saturation, and they used arterial blood gasses to confirm their suspicions. Now pulse oximetry allows nurses to identify level of oxygenation before clinical symptoms appear, and thus more promptly diagnose and treat underlying causes <sup>[5]</sup>.

### Technological advancements in nursing practice; changed the nursing practice, they are

#### 1.1 Enhanced Communication

Nurses use smart phones and apps, in receiving text messages and receive alarms from their patients through their phones. The smartphone, is a device that proposals a simply and open access to the information and communication. Nurses use smartphone in different field of their practices such as health care records, nursing care, education for patient and training and time management <sup>[6]</sup>.

The aim of Smartphone- based technology or mobile using among nurses as modern communication technologies improve healthcare personnel communication, workflow, and the providing care by fast communication, to diminish medical errors, these led to improvement in patient outcomes <sup>[7]</sup>.

Smartphone applications support nursing care and aimed to improve patient outcomes because smartphones permit suitable way to specialized information in fields as continuing education activities for patients about their disease condition and direct them to read more disease as,

prevention of complication, side effect of medication, diet therapy supported for this disease, to ensure meet the standards required for providing quality of needed care [8]. American Association of Colleges of Nursing support use of smart phones in nursing practices to enhance nursing

practices through they demonstrate skills in using patient care technologies, information systems, and communication devices that help them in providing efficient nursing practice for better their patient’s outcomes [9].



Fig 1: Smartphone- based technology (10)

**1.2 Use of technology innovation as**

Electronic Records, which allow everyone in the hospital to access the patient’s information with the touch of a button. A nurse can quickly see what medications the patient is

taking and which ones they are allergic too. They can check and review investigation results [11].

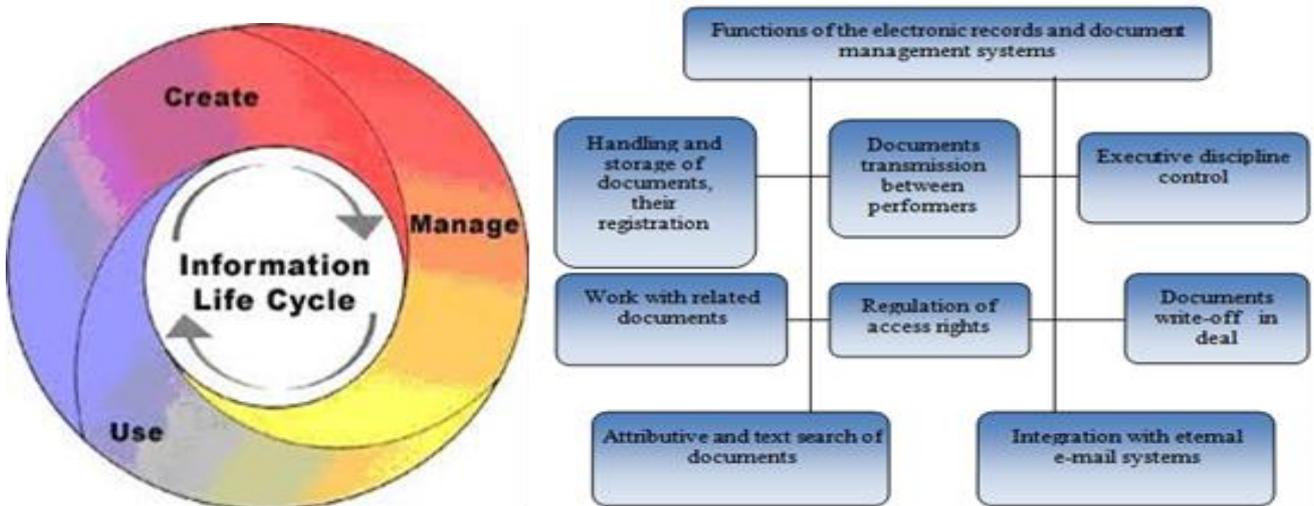


Fig 2: Processing and function of Electronic Records (10& 11)

Doctors can put notes that the nurse needs to see about the patient’s needs. The Electronic prescription record can also help in improving patient outcome and reduce drug mistakes

by pharmacists through monitoring and evaluating of use and by facilitating communication between healthcare providers [12].

## e-Prescriptions Denmark

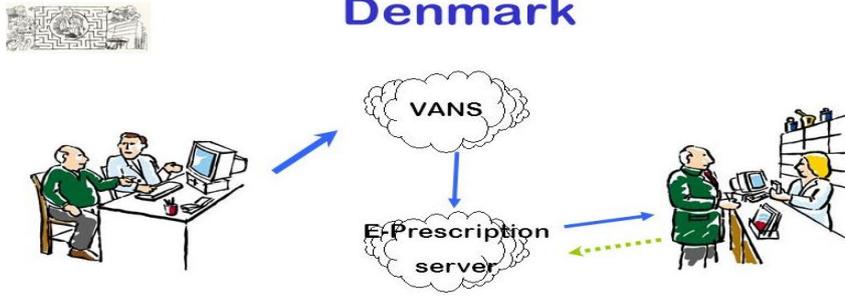


Fig 3: Electronic prescription (10&12)

Bar coding is an electronic technology, which reduces drug error, and aimed to increase patient safety measures with regard to administering medication through machine readable symbols ("bar codes") consider as a tool help in

appropriate dose of medication for the right patient. Recently the amount of knowledge increased within bar code scanning technology. All these ended improvement in outcomes of patients<sup>[13]</sup>.



## eMAR/Bar Coding Is ...

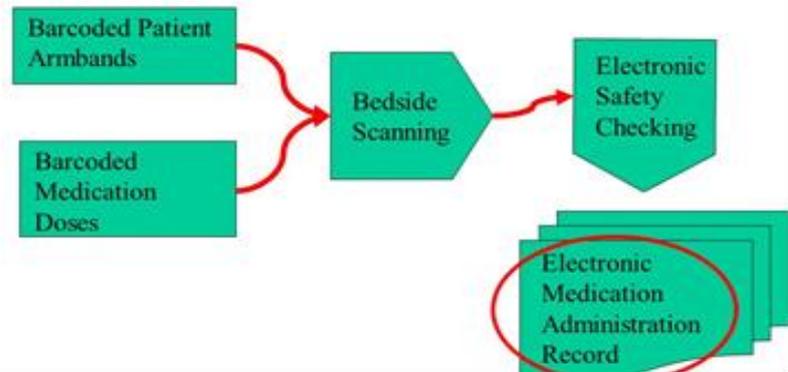


Fig 4: Bar coding (10&13)

### 1.3 Global Positioning System (GPS) tracking

Hospital having an indoor GPS tracking system for employees inside lead to hospital efficiency. Tagging and tracking medical equipment is much easier than it was before. Radio frequency identifications tags help nurses find

the nearest blood pressure machine or another piece of equipment. It sounds like a simple matter, but being able to centrally monitor equipment has increased bed management and patient care incredibly<sup>(14)</sup>.

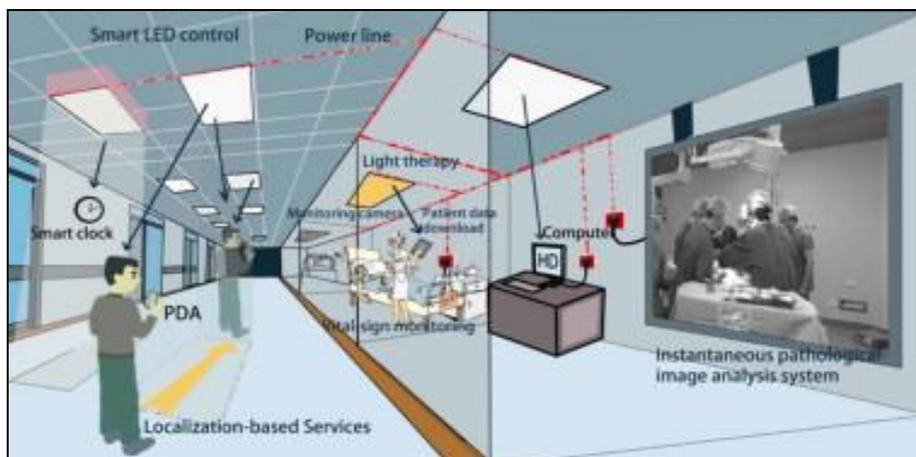


Fig 5: Indoor GPS tracking system (10 & 14)

Tracking patient flows for throughput management can help diagnose bottlenecks and monitor the implementation of appropriate solutions for problems such as extended waiting

times, overcrowding and boarding in outpatient clinics, emergency departments/rooms (ED/ER) and post-anesthesia care units (PACUs); bumped and late surgeries; and the

lack of available routine inpatient and intensive care unit (ICU) beds. This management help in the rapidly

improvement patient's status [15, 16].



Fig 6: Post-anesthesia care units GPS tracking system (10& 15)

Tracking an Ambulance with GPS; hospitals use GPS tracking for ambulance monitoring. These vehicles are literally mini hospitals on wheels that are equipped with

various healthcare tools designed to treat people on the spot to improve their status in life-threatening conditions and improve their outcomes [16, 17].

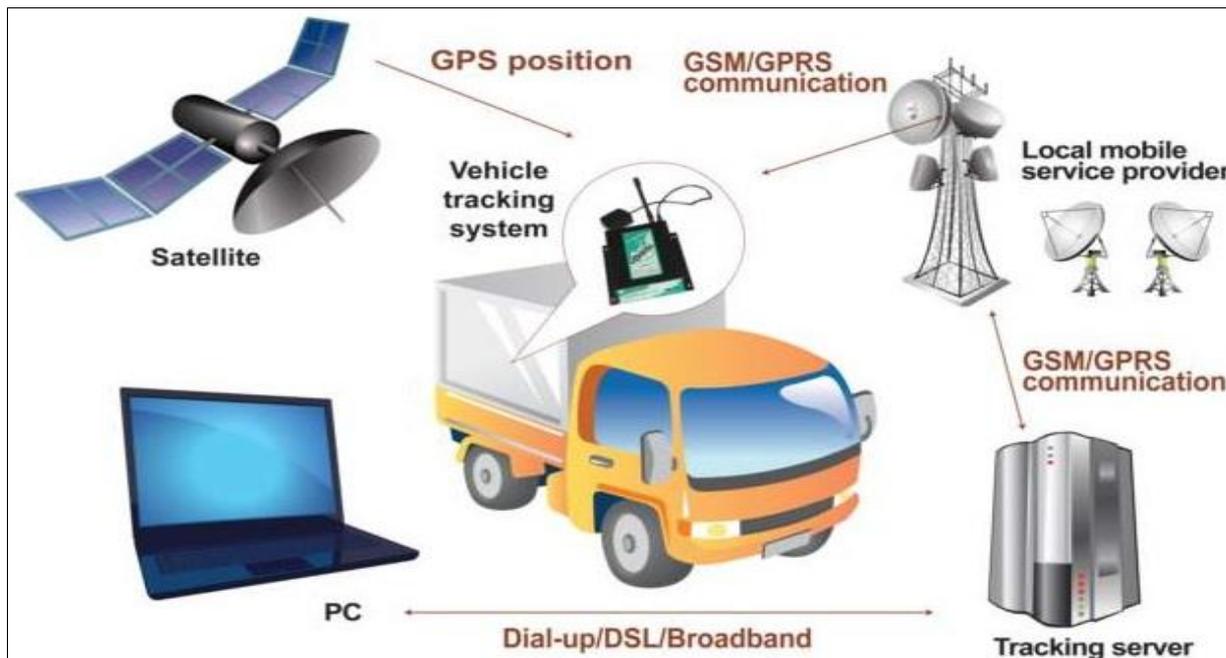


Fig 7: Ambulance with GPS (10& 16)

**1.4 Enhanced Diagnostic Devices**

Most of the technological advancements are help doctors, nurses, and the patients. Take for instance diagnostic exams. These can now be performed non-invasively. There are more options for nurses and doctors to choose from rather than the old-school tests and treatments [15]. Not only does it improve the cost-effective nature of testing, but it also

lowers the risks of infections. Handheld biosensors have the ability to detect all sorts of diseases. It just requires a small body specimen to give a definitive result. Another tool is ultrasound technology. When needing help placing an IV, an ultrasound machine can pinpoint the exact location to minimize patient distress and enhancement in patient recovery and planned outcomes [18].



Fig 6: Ultrasound technology (10& 17)

### 1.5 Pacemakers, Internal Cardiac Defibrillators, and Nerve and Spinal Stimulators

Implanted pacemakers, internal cardiac defibrillators (ICDs), nerve and spinal stimulators, and implanted drug delivery devices have the same concerns in the monoplace

chamber as in the multiplace chamber. Verification must be obtained that the specific device will function at the intended treatment pressure. Many pacemakers are acceptable, and the manufacturer should be able to provide their recommendations [19].

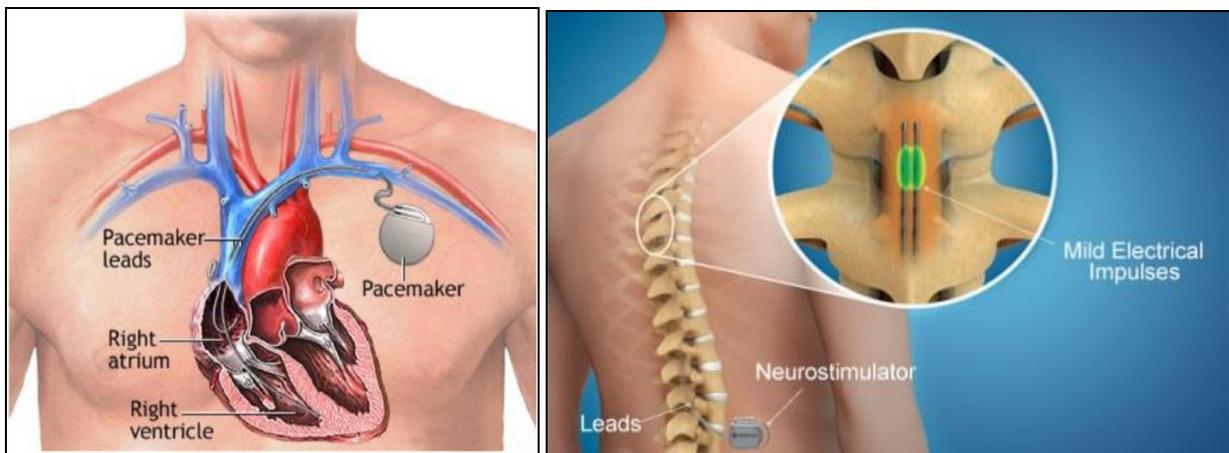


Fig 7: Pacemakers, and Nerve and Spinal Stimulators (10&18)

### 1.6 Drug Delivery

Many hospitals have implemented drug delivery systems that come in an implantable device form. These devices release medication into the patients at the required times. The nurses can schedule the dose and make sure that their

patient gets the medications they need, in the correct dosing, at the appropriate time. This reduces the chance of a patient error, potential lawsuits and improved the aimed patient's outcomes [13, 20].

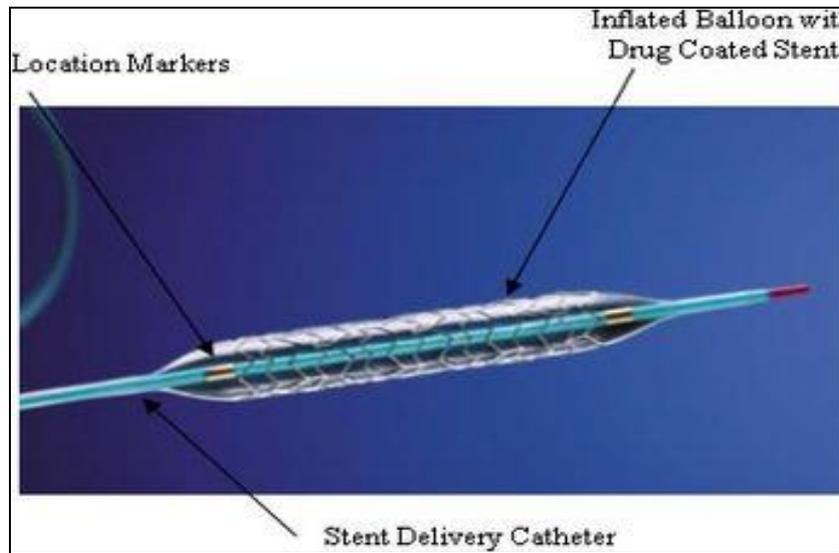


Fig 8: Implantable device form (10& 20)

New drug delivery systems include lipidic, proteic and polymeric technologies to provide new sustained drug delivery with better body distribution, drug protection from the harsh external environment and avoidance of drug clearance. The use of nanotechnology for drug delivery

rapidly and can be used in other fields such as gene delivery, imaging and diagnostics. So New drug delivery systems enhancement the wanted patient’s outcomes and also allows the nurses to focus on other areas that need their attention [21].

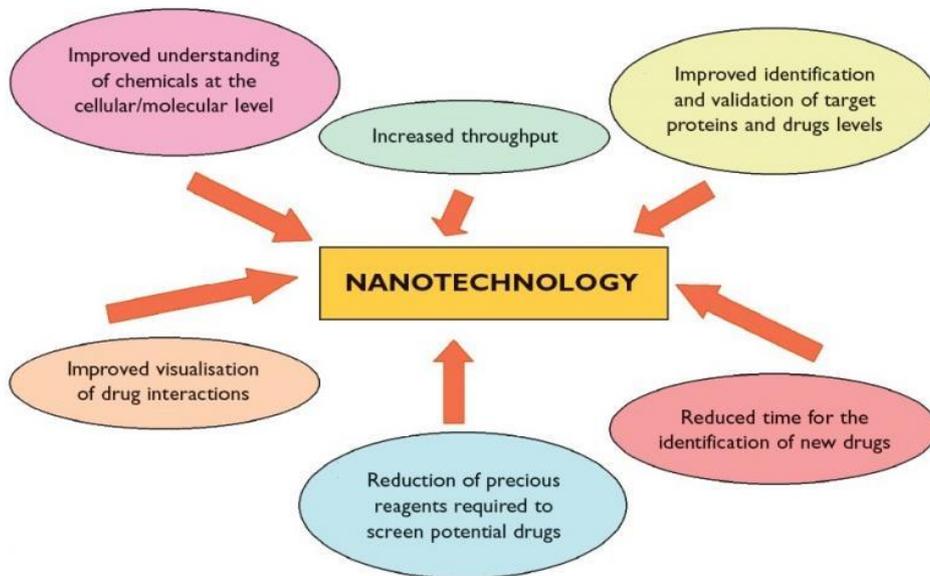


Fig 9: Role of nanotechnology in drug delivery (10&21)

**1.7 Long-Circulating Therapies for Cancer Treatment (Cancer drug delivery systems)**

In the emerging field of nanotechnology, nanoparticles hold promise for overcoming challenges associated with many cancer drug delivery systems. They possess enormous potential by providing a means of modifying the fate of an active substance in vivo and of increasing drug concentration in the target tissue, thereby improving pharmacological efficacy and reducing side-effects related to systemic toxicity. However, their applications are limited by rapid clearance from circulation by the reticuloendothelial system [22, 23]. Characteristics that prolong circulation must be taken into account in the design of an optimized cancer delivery system. Considerable

progress has been made over the past several decades to address this problem with surface treatment (alteration/modification) strategies in the development of nanoparticles with an acceptable blood circulation time. Manipulation of these parameters influences the pharmacokinetics of the delivery system, focus on polyethylene glycol (PEG) modification of nanoparticle as the current gold standard in the field of so-called stealth nanoparticles, and address advantages and disadvantages of PEG-modified nanoparticles. Other biomaterials and methods that have been introduced as alternatives in designing drug delivery systems that can be disguised as “self” and remain unrecognizable to immune system [24].

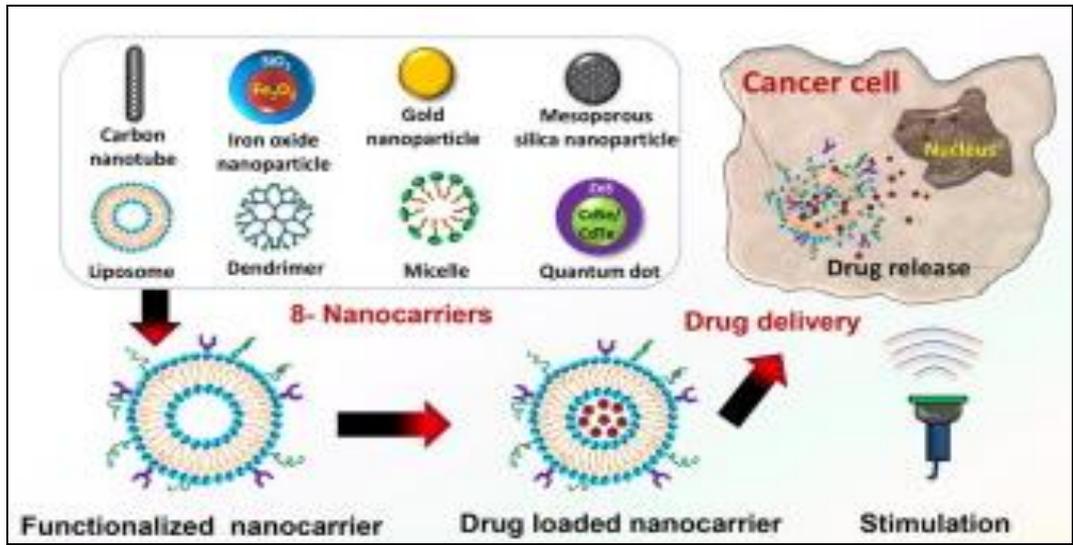


Fig 10: Long-Circulating Therapies for Cancer Treatment (24)

### 1.8 Smarter Alarm Systems

An alarm is an automatic warning aimed at getting the caregivers' attention, alarms are important and sometimes life-saving. Patient alarms are one of the most essential means by which clinicians are alerted to potential dangers facing patients [20]. So most of hospital around the world use of alarm systems and there will be the sound of beeps coming from the patients' rooms. These beeps kept the nurses running from room to room trying to see what was going on. However, many times these alarms were false or a machine was just beeping to be reset. It caused what is known as "alarm fatigue." These beeping devices take the nurse's attention away from important tasks for things that are not of a trivial matter [25].



Fig 11: Smarter Alarm Systems (10 & 25)

With the advancement in smart alarm technology is used to monitor vital signs for the nursing staff. All vitals run through one system. Checking blood pressure or pulse rates has never been so easy. This integrated system measures

physiological indicators. If there is a real cause for alarm, the machine will let the nurse know. These alarm systems are more modernized and efficient in providing accurate measurement to direct proper interventions which decrease complications and improving patient's outcomes [26].



Fig 12: Monitor vital signs (10& 26)

### 1.9. Lifting Patients with Ease

The statistical report from Veteran's Administration documented that, each year more than 2,400 nurses are injured by lifting their patients. Most of the injuries are debilitating and cause the nurse to lose work time and money. If the patient is of a larger size and the nurse is smaller, it can be a real challenge to safely move [22].

The new devices have come on the scene that allows nurses to use lifting technology that saves their backs. Now, many hospitals are using such technology in their patients' rooms. Technology in lifting patients by the use of electrical or hydraulic power allows heavy patients to be transferred while decreasing stress on caregivers and also reducing the number of nursing staff required to move patients. It also reduces the chance of orthopedic injury from lifting patients [25].



**Fig 13:** Technology in lifting patients (10& 25)

As a nurse, you can lead the way to creating and maintaining a culture of safety by supporting and modeling safe patient-handling practices on your unit. A patient’s mobility status affects treatment, handling and transfer decisions, and potential outcomes (including falls). A step in the right direction is patient assessments, preventing staff injuries and patient falls and achieving better patient’s outcomes [26, 27].

Three different approaches to supplying the equipment

needed to mobilize patients; installing overhead lifts—ceiling tracks to which lifting slings are attached. Using portable lifts—floor-mounted structures for mobilizing patients that can be moved around as needed going the “equipment light” route—using a low-tech system that combines slide sheets, limb lifters, and slide boards to mobilize patients instead of using ceiling-mounted or portable floor lifts [28].



**Fig 14:** Slide sheets and limb lifters (10& 28)

**2. Conclusion**

Nurse’s capability to understand and direct the balance of patient care with the technology systems and organizational structure that supports this balance toward patient’s outcomes. Technological advancements in nursing practice have changed the nursing practice, they are; Enhanced Communication; Use of technology innovation; GPS tracking; Enhanced Diagnostic; Pacemakers, Internal Cardiac Defibrillators, and Nerve and Spinal Stimulators, Drug Delivery; Long-Circulating Therapies for Cancer Treatment (Cancer drug delivery systems), Smarter Alarm Systems and Lifting Patients.

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